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Archives of PHYSICAL MEDICINE and REHABILITATION

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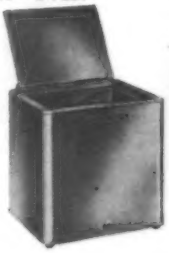

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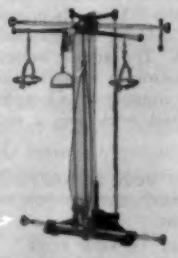

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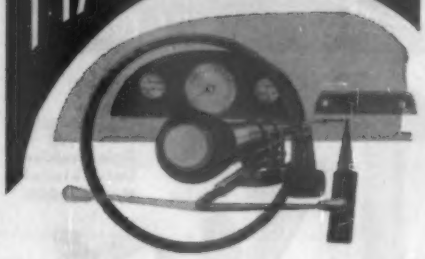

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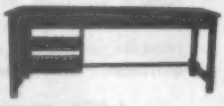
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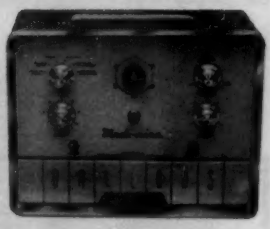

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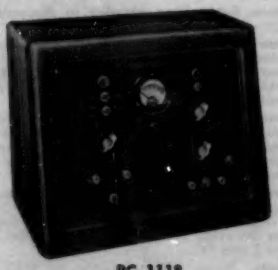

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Electromyographic Observations in Patients with Tetanus: With Special Reference to the Effect of Drugs

M. A. Perlstein, M.D.
Marcos Turner, M.D.
and
Harry Elam, M.D.
Chicago

● Seven patients with tetanus, four of them heroin addicts, were followed clinically and electromyographically, both in the acute stage of the disease and during treatment with various drugs. EMG activity without medication was characterized by silence or by fasciculatory and repetitive activity in the intervals between spasms and by an interferential curve during the spasms. Effects of Chlorpromazine, Pentobarbital, Meprobamate and MR 710 are described.

There are very few reports on electromyographic (EMG) studies in tetanus. Acheson, Ratnoff and Schoenbach[1] recorded the EMG response to electrical and mechanical stimulation of cats injected intramuscularly with tetanus toxin. They found an increased response localized to the muscles of the injected limb, and interpreted this increased excitability as due to localization of the toxin in the corresponding segments of the spinal cord. Only one report has come to our attention on EMG studies in human tetanus. Schmidt and coworkers,[2] employing both EMG and EEG, studied the effect of *d*-tubocurarine on tetanus spasms in man.

We have recently had the opportunity of following seven patients with tetanus in whom various therapeutic procedures were tried. We were interested in the EMG findings during the acute phase of untreated tetanus, and the effect of various drugs on the EMG.

Material and Methods

Seven adult patients with acute tetanus were the subjects of this study. Of these, four were heroin addicts in whom fatal tetanus was caused by contaminated injections. The remaining three patients, nonaddicts, recovered. All patients were seen in the acute phase of the infection and all had severe spasms on admission.

The EMG findings were observed and tape-recorded using a Meditron electromyograph, with unipolar needle electrodes inserted into the masseter or trapezius muscles. The EMG was done before the patient received medication and also after administration of various drugs to observe their effect on the EMG activity. The EMG response to different types of stimuli (auditory, visual, tactile, painful, proprioceptive, and visceral) before and after medication was also investigated. The drugs studied in these patients were chlorpromazine (Thorazine), meprobamate (Miltown), pentobarbital (Nembutal), and compound MR 710 (Dicyclopropyl ketoxine).* With the exception of MR 710, which was given orally, the parenteral route was used.

*Thorazine supplied by Smith, Kline and French; Miltown supplied by Wallace Laboratories; Nembutal and Dicyclopropyl ketoxine supplied by Abbott Laboratories.

All medications began to act in about 10 minutes after their administration. The effect of chlorpromazine and pentobarbital lasted for about 1 to 3 hours, and of meprobamate and MR 710 about 3 to 4 hours, depending on the dose.

The clinical effect of the various drugs on the spasms and course of tetanus, briefly summarized in this paper, is discussed more fully in a separate communication.[3]

Results Before Medication

Activity "at Rest." In the periods between spasms, electrical "silence" was recorded even in the severe cases. Scattered spontaneous activity was common

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This study was aided in part by grants from the Muscular Dystrophy Association and United Cerebral Palsy, Chicago; and Wallace Laboratories, New Brunswick, N. J.

and consisted of the firing of one or more motor units at a frequency of 1 to 10 per second, with waves of normal shape, amplitude, and duration (mono- or biphasic, 500-2000 microvolts and 5-10 milliseconds, fig. 1*A*). This activity was similar to that observed with normal muscle during very weak efforts, such as postural activity, or with irritative lesions of the motor spinal neurons in the absence of visible voluntary motion, as in such conditions as spinal muscular atrophy, lateral sclerosis, or transverse myelitis. However, none of the abnormal potentials, such as fibrillations and giant or polyphasic potentials, which are also present in spinal lesions, were seen in the tetanus cases. The spontaneous EMG activity was increased by voluntary motions or by muscle activity induced by the various types of stimulation. In both instances, additional motor units were observed to be firing with increasing frequency until gradually or suddenly they overlapped and tended to transform the EMG curve into the in-

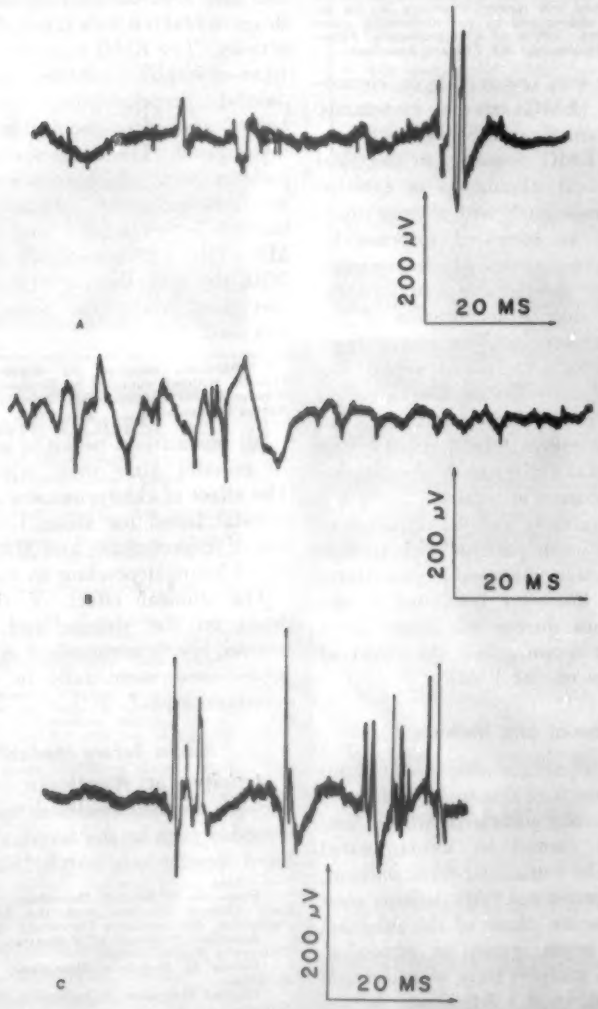

Fig. 1 — EMG potentials, at rest before Miltown: *A*, spontaneous fasciculations; *B*, insertion potentials; *C*, repetitive activity.

terferential patterns characteristic of forcible muscle contraction. This same pattern was also seen when spontaneous or induced spasms or trismus (lockjaw) occurred.

The insertion and manipulation of the needle electrode in situ elicited characteristic "insertion potentials," that is, very short (1-2 milliseconds) and frequent (30 or more per second) potentials with a characteristic pinging sound on the loudspeaker (fig. 1*B*). The impression was gained that these insertion potentials were more intense and prolonged than in normal cases.

Another interesting finding was the presence of "repetitive potentials," that is, motor unit potentials repeated at very short intervals (5 to 15 milliseconds) in aggregates of two, three, or four (fig. 1*C*). Although this type of repetitive activity was observed by Gilson and Mills[4] in normal subjects, and by Denny-Brown[6] in some reflex activities, the fact that it disappeared in our patients after drug administration made us believe that these repetitive potentials are an expression of increased excitability of the anterior horn cells. They may be related to the repetitive potentials first described by Turpin and Lefebvre[6] and by Alajouanine, Contamin, Cathala and Scherrer[7] in cases of tetany.

Effect of Stimulation on EMG. Tetanus patients are very sensitive to most stimuli. Clinically, generalized spasms, opisthotonus or trismus were easily elicited by the following stimuli:

1. Exteroceptive or Somatic.
   a) Auditory — sudden noises as by clapping the hands, banging a door, dropping a metallic object onto the floor or even loud speech.
   b) Visual — a bright light flashed into the eye.
   c) Tactile — sharply tapping or simply touching any part of the body, or sprinkling of water on the abdomen or face.
   d) Painful — pricking some cutaneous area with a pin.
2. Proprioceptive—passive movement or stretch of a joint (finger, wrist, neck, knee, etc.) or simply turning or lifting the patient.
3. Interoceptive or Visceral—tracheal aspiration, gagging with a tongue depressor, passing of a bladder or a nasal catheter.

The spasms elicited by any of the foregoing stimuli caused an EMG pattern characterized by an interferential curve, that is, one without isoelectric intervals where the isolated motor unit potentials cannot be seen because of their superimposition (fig. 2*A*).

Results Following Medication

Activity "at Rest." Chlorpromazine (25-50 mg., intravenously or intramuscularly), meprobamate (400 mg. intramuscularly), pentobarbital (200 mg. intramuscularly), and MR 710 (900 mg. orally), were all effective in reducing the spontaneous activity "at rest." With meprobamate and MR 710, an isoelectric line was obtained without the spontaneous "fasciculatory" and "repetitive" potentials described above (fig. 3).

Meprobamate and MR 710 reduced the frequency of spontaneous spasms without proportionate soporific effects. Pentobarbital, on the other hand, caused the patient to lapse into deep sleep before anticonvulsant activity was manifested. Chlorpromazine had an effect similar to pentobarbital but was less soporific.

Meprobamate and MR 710 were also more effective than the other two drugs in reducing the insertion potentials of the needle electrode.

Effect of Stimulation on EMG. Meprobamate dramatically eliminated the reflex spasm induced by all exteroceptive stimuli, whether auditory, visual, tactile, or painful, but had very little effect on spasm elicited by proprioceptive and visceral stimuli. Thus, pinprick did not precipitate a spasm, but caused only slight local fasciculation (fig. 2*B*). On the other hand, severe clinical spasms and EMG interferential patterns were elicited by turning the patient or by cleaning out the tracheal tube (fig. 2*C*). In spite of complete control of exteroceptively triggered spasms, the patients

were conscious and able to talk and thus able to pinpoint areas of visceral distress, such as distended bladder or bowel.

Chlorpromazine and pentobarbital raised the threshold for but did not eliminate the reflex spasm elicited by each of the various types of stimulations mentioned above. Unlike meprobamate, they were equally effective against all types of stimuli, extero-, proprio-, and interoceptive. The spasms were electromyographically recorded as interferential patterns, characteristic of massive muscular action. The antispasmodic action of these drugs was roughly proportionate to their soporific effect.

Compound MR 710 was given to only three patients, all heroin addicts. It was

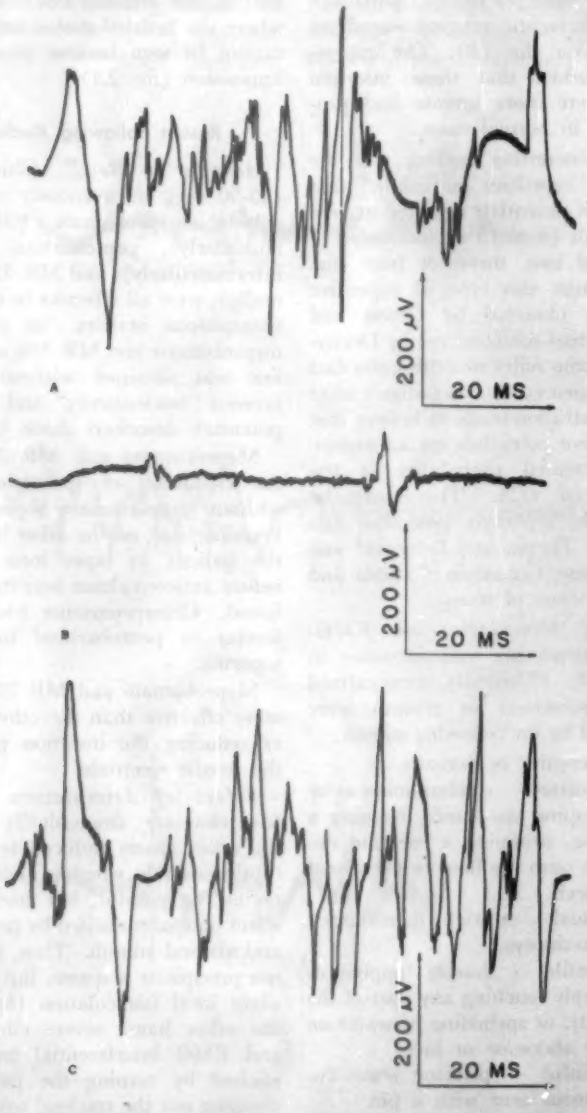

Fig. 2 — Effect of stimulation on EMG: A, before Miltown, interferential pattern associated with clinical spasm; B, after Miltown, exteroceptive stimulation (pinprick); C, after Miltown, interoceptive stimulation (suction of tracheal tube).

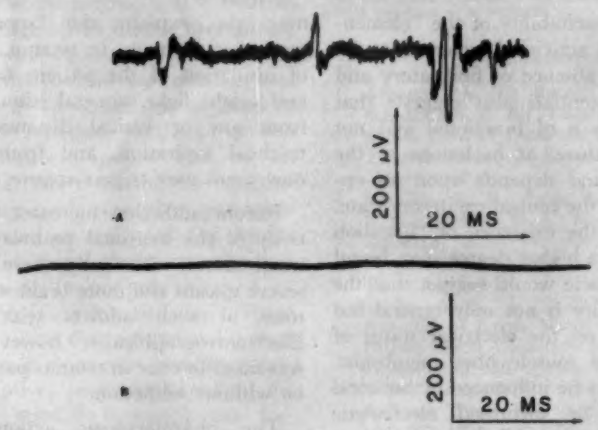

Fig. 3 — A, EMG at rest before meprobamate; B, EMG at rest after meprobamate. Note complete "silence" after the drug. This effect was seen to a lesser degree with each of the four drugs employed, but to the greatest degree with meprobamate and MR 710.

the only drug that eliminated activity, both spontaneous and induced by all types of stimuli, extero-, proprio-, and interoceptive. The drug caused some sleepiness, but this was not proportionate to its antispasmodic effect.

Comment

Sherrington in his classical book *The Integrative Action of the Nervous System* repeatedly refers to his experience with tetanus toxin. He compares its effect on several levels of the nervous system to that of strychnine, and it is pertinent here to quote some of his interesting observations and deductions.

Discussing the effect of strychnine or tetanus toxin upon reciprocal innervation, he observes: "These disorders work havoc with the co-ordinating mechanisms of the central nervous system because ... they change the reciprocal inhibitions, normally assured by the central nervous mechanisms, into excitations. The sufferer is subjected to a disorder of co-ordination which, though not necessarily of itself accompanied by physical pain, inflicts on the mind, which still remains clear, a disability inexpressibly distressing. Each attempt to execute certain musculature acts of vital importance, such as the taking of food, is defeated because from the attempt results an act exactly the opposite to that intended. The endeavor to open the jaw to take food or drink induces closure of the jaw, because the normal inhibition of the stronger set of muscles (the closing muscles), is by the agent converted into excitation of them."[8]

Because tetanus toxin resembles so closely strychnine in its action, it is appropriate, also, to quote Bremer[9] who studied strychnine effect on the central nervous system: ". . . spinal strychnine tetanus is the most perfect expression of the synergy of elementary electrical activities in a mass of nerve cells . . . This synergy cannot be explained by synaptic transmission of intraspinal impulses . . . Everything suggests that this neuronal synergy is effected by an intercellular action, truly electrical in nature which spreads . . . with the speed of an explosion and synchronizes, over wide areas, the pulsations of autorhythmic elements possessing nearly identical individual frequencies."

Support for the view that increased *neuronal*, rather than *synaptic* sensitivity, is the neurophysiologic basis of tetanus is forthcoming, also, from the work of Wright and co-workers,[10] who studied cephalic tetanus in animals. Our own EMG observations are in general agreement with the foregoing opinions and, furthermore, add some new evidence. Fasciculatory and repetitive firing of the motor units of the masseter and trapezius between spasms may be the expression of

an increased excitability of the "elementary electrical activities" referred to by Bremer. The absence of fibrillatory and polyphasic potentials also suggests that this irritability is of functional and not of organic nature, as in lesions of the spinal cord, and depends upon an enhancement of the central excitatory state. Nevertheless, the existence of "insertion potentials" to a higher degree than found in normal muscle would suggest that the hyperexcitability is not only central but also depends on the electrical status of the peripheral muscle fiber membrane. The latter may be influenced by humoral factors and by disturbed electrolytic balance in patients with tetanus.

The repetitive activity in the EMG may well be a typical expression of a state of perturbation of the reciprocal process of excitation and inhibition. It is also observed in myotonies and in tetany, and would suggest a similar physiopathologic background in these conditions. EMG studies by us in the pseudohypertrophic group of muscular dystrophies have shown a similar pattern. The difference is only quantitative in nature. In tetanus as in tetany, the repetitive activity generally does not exceed two or three firings of the same motor unit (doublets and triplets). In myotony and in muscular dystrophy, longer sustained outbursts of 5 to 10 or more discharges are more common (myotonic discharges).

The facility with which various stimuli cause generalized reflex spasms in tetanus patients with the EMG characteristics of maximal activity of the anterior neuron pool is also in agreement with the viewpoint of Sherrington and Bremer that strychnine and tetanus toxin alter reflex action conduction and synchronize wide areas of autorhythmic nerve cells. Only under such pathologic enhancement of the central excitatory state are such varied stimuli as auditory, visual, tactile, interoceptive and proprioceptive likely to be so diffusely irradiated in the central nervous system.

This state of exaggerated hyperexcitability and irradiation, and this inversion of the inhibitory into an excitatory state, may also explain the "spontaneous" spasms so common in tetanus. In spite of insulation of the patient from noise and bright light, visceral stimuli arising from gut or vesical distension, from tracheal aspiration, and from postural movement may trigger spasms.

Heroin addiction increases the sensitivity of the neuronal pathway to electrical stimuli. Clinically, there are more severe spasms and more brain stem symptoms in such addicts with tetanus. Electromyographically, however, there was no difference in tetanus patients with or without addiction.

The pharmacologic action of the various drugs employed may be due to a reversal of the central action of the toxin — that is, decrease of motor unit excitability, and of hypersynchronization of the spinal and central gray matter and re-establishment of the central mechanism for reciprocal inhibition. However, the several drugs seem to act at different levels, or in different structures. Pentobarbital appears to act more upon the central mechanism involving sleep and consciousness (possibly the cortex and the ascending activation system of the brain stem); chlorpromazine seems to act on the reticular substance and the descending pathways of the same system. Magoun and Rhines[11] have demonstrated that these pathways exert an important influence upon the excitatory state of the final common path. Meprobamate and MR 710, on the other hand, seem to be more active on the lower levels and do not affect consciousness to the same degree as pentobarbital and chlorpromazine. Meprobamate seems to act specifically on the afferent or sensory portion of the exteroceptive system only. MR 710 appears to be more effective in abolishing the irradiation of reflexes originating in proprio- and interoceptive as well as in exteroceptive pathways, and may, in fact, be acting on the common premotor pathway for all of these systems.

Summary and Conclusions

Seven patients with tetanus, four of them heroin addicts, were followed clini-

cally and electromyographically, both in the acute stage of the disease and during treatment with various drugs.

EMG activity without medication was characterized by silence or by fasciculatory and repetitive activity in the intervals between spasms and by an interferential curve during the spasms. Fasciculatory and repetitive potentials are interpreted as a sign of hyperexcitability of the spinal motor neurons and the spasms as hypersynchronization of this activity in many neurons. These spasms simulate the paroxysmal spinal seizures seen in strychnine overdosage.

Exteroceptive, proprioceptive and interoceptive stimuli increased the frequency and intensity of the spasms. Chlorpromazine and pentobarbital reduced but did not eliminate the spontaneous EMG activity at rest and the number of spasms, triggered by various stimuli. However, these drugs caused sleepiness to the point of coma. Meprobamate eliminated the spontaneous activity at rest and dramatically stopped spasms caused by painful and other exteroceptive stimuli but did not prevent the spasms elicited by proprioceptive or visceral stimuli. MR 710 diminished the spontaneous activity at rest and also diminished the seizure reaction to all stimuli including proprioceptive and visceral. This drug had a soporific effect greater than meprobamate, but less than chlorpromazine and pentobarbital.

The authors are indebted to Mrs. Nelda Turner, EMG technician for technical assistance and to Y. T. Oester, M.D., Department of Physical Medicine and Rehabilitation, Cook County Hospital, for advice and loan of equipment.

References

1. Acheson, G. H.; Ratnoff, O. D., and Schoenbach, E. B.: Localized Action on Spinal Cord of Intramuscularly Injected Tetanus Toxin. J. Exper. Med. 75:465 (May) 1942.
2. Schmidt, R. P.; Levy, L. L.; Turrell, R. C.; Hopkins, W. E.; Bloor, B. M., and Roseman, E.: Tr. Am. Neurol. A. 77:122, 1952.
3. To be published.
4. Gilson, A. S., Jr., and Mills, W. B.: Activities of Single Motor Units in Man During Slight Voluntary Efforts. Am. J. Physiol. 133:658 (July) 1941.
5. Denny-Brown, D. E.: Nature of Postural Reflexes. Proc. Roy. Soc., London s.B 104:252 (Feb. 4) 1929.
6. Turpin, R. A., and Lefebvre, J.: Resultats d'etudes Electrologiques et humorale de la tetanie. Presse med. 51:338 (June) 1943.
7. Alajouanine, T.; Contamin, F.; Cathala, H. P.; and Scherrer, J.: Contribution électro-myographique á une délimitation de la tétanie de l'adulte. Presse méd. 62:339 (Mar. 3) 1954.
8. Sherrington, C.: Integrative Action of the Nervous System, ed. 2, New Haven, Conn., Yale University Press, 1948, pp. 297-298.
9. Bremer, F.: Strychnine Tetanus and Mechanism of Neuronal Synchronization. Proc. Soc. Exper. Biol. & Med. 46:627 (April) 1941.
10. Wright, E. A.; Morgan, R. S.; and Wright, G. P.: Tetanus Intoxication of the Brain Stem in Rabbits. J. Path. & Bact. 62:569 (Oct.) 1950.
11. Magoun, H. W., and Rhines, R.: Spasticity — the Stretch Reflex and Extrapyramidal Systems, Springfield, Ill., Charles C Thomas, Publisher, 1948.

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Rehabilitation of the Elderly Double Above-Knee Amputee

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and
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● Though not commonly encountered, the elderly double above-knee amputee presents one of the most difficult problems in rehabilitation. Clinical experience with a small group of these patients indicates that there are a number of significant factors related to incidence, age, distribution, complicating diseases, selection of patients for prostheses, the type of prosthesis, stubbies or full length limbs, the rehabilitation goals and the feasibility of these patients functioning in the community. This presentation offers some solutions in relation to these problems and suggestions as to areas requiring further clarification and investigation.

With the growth of the field of physical medicine and rehabilitation new questions are posed in the care of the chronically ill. One group of patients for whom new therapeutic problems have arisen is the elderly (60 and over), bilateral, above-knee amputee. In an earlier period these patients were generally considered permanently wheelchair-bound. However, the participation of these patients in rehabilitation programming has led to a re-evaluation of their status. What are the realistic goals that the elderly, above-knee amputee may attain? What criteria may be used in determining whether these patients will learn to walk with prostheses?

During the past five years there have been 50 double above-knee amputees admitted to Bird S. Coler Hospital. All except one of this group were 60 years or over at the time of the study (the one exception is a 43-year-old woman with thromboangiitis obliterans). This study is concerned with the problems of the 49 elderly patients, 48 of whom had amputation as the result of arteriosclerotic peripheral vascular disease with or without diabetes. One patient, 79 years old, had a traumatic bilateral above-knee amputation at the age of 34. This paper discusses their care on the basis of: (1) their medical status, (2) their rehabilitation potential, (3) their rehabilitation program, and (4) their physiological capacities.

Medical Status

The group of 49 double, above-knee amputees constitutes approximately 1 per cent of the total admissions during this 5-year period, the ratio of male to female being about 2.5 to 1. All the patients had had their amputations prior to their admission to Coler Hospital.

The mortality rate during this 5-year period was 29 per cent. Fourteen patients died prior to or during the study. Table 1 gives the average age of the living patients and their survival period since their second amputation. The average at present for this group is 73 years. This average age corresponds closely to the average age at death of 72.5 of the 14 who expired. In the surviving group approximately 40 per cent to date have survived 3 or more years beyond the second amputation.

Table 1: Survival after Second Amputation in 35 Patients*

Interval	No.
1 - 6 months	3
6 - 12 months	3
1 - 2 years	8
2 - 3 years	7
3 - 4 years	3
4 - 5 years	3
5 years and over	8

*Average age, 73.0 years.

The average interval between amputations was 1.9 years (table 2) and 50 per cent of the group had their second

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amputation within one year of the first (table 3).

Table 2: Average Age First and Second Amputation*

	Age	Range
First	65.6	40-91
Second	67.5	40-91

*Omitted one case traumatic amputation at age 34.

Table 3: Time Interval between Amputations*

Interval	No.
Same	11
1 - 6 months	6
6 - 12 months	7
1 - 2 years	5
2 - 3 years	9
3 - 4 years	1
4 - 5 years	3
5 years and over	6

*Omitted one case traumatic amputation at age 34.

These figures have therapeutic significance since the ability to achieve ambulation on two artificial limbs is enhanced if the patient has had prior experience in walking with one limb. In this group of patients with a relatively short period between the two amputations, the opportunity for ambulation on one limb seldom occurred. A review of the social history of our cases indicates a possible means of lengthening the interval between the first and second amputation. The social histories revealed that the majority were single or widowed and living isolated lives before the second amputation. Since prophylactic care plays such an important role in the patient with occlusive arterial disease, it is conceivable that the poor social circumstances represented an important factor contributing to the second amputation. Confirmation of this preliminary observation would emphasize the need for proper placement of the single unilateral elderly amputee in a more socially stable environment.

Of special significance is the relationship of average age of second amputation in the entire group, 67.5 years (table 2), to the average age of death, 72.5, in the deceased group. The resulting survival period of 5 years beyond the second amputation is quite adequate to justify the rehabilitation efforts.

In table 4 the associated medical conditions are reviewed. As anticipated, diabetes and arteriosclerotic cardiovascular diseases were present singly or in combination in many of the patients. The major part of the remaining associated medical conditions represented the effects of degenerative changes. The one case of hernia was in a patient with a large scrotal hernia which prevented fitting with artificial limbs.

Table 4: Associated Conditions

Disease	Frequency
Diabetes	21
Hypertension	8
Arteriosclerotic Cardiovascular Disease	23
Cataracts	7
Hemiplegia	7
Pulmonary Disease	5
Hernia	1

Rehabilitation Potential

There are no sharply defined criteria for the selection of the knee amputee who is likely to succeed in ambulation. We have found from experience, however, that the following factors must be considered:

1. Whereas chronological age is not a contraindication to training, physiological age is paramount. Associated medical conditions which often reflect physiological age represent a major factor.
2. Any impairment in upper extremity function as in arthritis or neurologic involvement with weakness is a practical contraindication for ambulation.
3. Special sensory loss such as blindness may prove to be a contraindication to training.
4. The presence of hip flexion contracture beyond 10 to 15 degrees has proved to be the major cause for rejection in several patients who otherwise would have been good candidates for ambulation.
5. Sex differences in attitude toward wearing pylons is reflected in the fact that all eligible female patients refused to consider stubbies.
6. As in any rehabilitation activity, the motivation of the patient is a

primary consideration. Learning to walk for the young, double, above-knee amputee is laborious. For the elderly, the effort is even greater. The expression of wanting to walk on the part of the patient is not sufficient evidence of motivation. It must be demonstrated through effort.

7. Psychiatric status must be considered. Although disturbed personality is not in itself a contraindication, the advanced deterioration of senility precludes training.

Case Presentations

Based on the foregoing factors we were able to accept five male patients for prosthetic training. Since none of the female patients use pylon prostheses, these five represent over 20 per cent of the male surviving group. The ages of the five patients who have been involved in rehabilitation now are 61, 67, 68, 68, and 75 years. They had their second amputation at the ages of 59, 55, 64, 67, and 74 respectively.

Case 1. This patient was 65 years old at the time of admission to our service and had his first amputation 21 years earlier and the second amputation 10 years before admission. He was very obese (weight 181 lb.) and his vision was poor. He had been maintained in a custodial institution for over 21 years. To offset these negative factors he had an intense desire to achieve ambulation. He was fitted with stubbies and rapidly became independent with crutches. This patient was discharged to a boarding home in the community after 23 years of institutional living.

Case 2. This patient was 67 years old at the time of admission and 64 years old at the time of second amputation. He was somewhat obese and had been hospitalized for the three years since his second amputation. His motivation and physical skill matched that of the first patient and he too rapidly achieved independent ambulation and was discharged to the community for several months. He was returned to the hospital because of problems of social adjustment in the home, and community discharge is again being explored.

Case 3. This patient was 60 years old on admission and 59 at the time of second amputation. His desire to achieve ambulation was considerably less than the first and second cases. Progress in ambulation training was slower and he is just beginning to achieve independent ambulation with crutches.

Case 4. This 75-year-old patient is the oldest amputee in our service. He had his second amputation at the age of 74 and this occurred within six months of the first amputation. He is agile for his age and has just been fitted with his limbs. It is anticipated that independent ambulation will be achieved and he will be discharged to the community.

Case 5. This patient is now 68 years old and was 67 at the time of the second amputation. He has completed his preparatory period of training and should be fitted with limbs in the near future.

A review of these five cases emphasizes the point that sharply defined criteria are not available for rehabilitation evaluation. Case 1 emphasizes this most emphatically. At time of admission we saw an elderly obese male who had extremely limited vision. Our estimation of his prognosis for ambulation was guarded. His achievements far exceeded our expectations, both in the speed with which they were attained and his final goal. On the other hand, the third case illustrates that, though the patient had a more favorable status — relatively young, thin, and in good medical condition — his achievement to date has been much below that of the first two patients. The evaluation of these patients for rehabilitation requires a careful analysis of the patient's medical status and his motivation for ambulation.

Rehabilitation Care

Ideally, rehabilitation care in these patients should commence prior to surgery of the first amputation. The patient who is properly prepared prior to surgery by both physical conditioning and psychological preparation for ambulation is uniformly a better candidate for rehabilitation. Because of the significant work that is imposed on the cardiovascular system of double amputees, these

patients should be carefully evaluated in terms of their cardiac tolerance. They should be studied in regard to pulse, respiration, and blood pressure before, during, and after exercise stress. Any unusual deviations from normal reactions, and especially the development of angina and dyspnea, require special evaluation before limbs are prescribed.

In the care of the elderly, bilateral, above-knee amputee the procedures appropriate for rehabilitation of any lower extremity amputee are employed. These include: (1) stump conditioning, (2) prevention of contracture by active and passive range of motion of the hips, (3) where a contracture is present, its treatment by passive stretching, (4) preparation of the upper extremities by graduated resistive exercise for carrying the weight on crutches, (5) proper fitting of the prosthetic appliance, (6) training in balance, (7) ambulation in parallel bars, and (8) ambulation with crutches, including stair climbing. Rehabilitation should be completed one month after the prostheses are properly fitted. The actual time in this series was somewhat longer because of intercurrent illness, which is not infrequent in this elderly group.

Prosthesis. The prosthesis used in this group of patients was the stubby (pylon). This device offers the advantage of lowering the center of gravity, thus reducing the incidence of falls, and where falls do occur, the incidence of significant injury. Also, by eliminating the knee joint, the patient's control of the prosthesis is greatly simplified. The major objection to the use of a stubby is its cosmetic effect. The patient's height is noticeably reduced. As has been stated, all women refused these devices. Even the patients who finally accepted the stubbies as a means of ambulation objected to their appearance. Another criticism relates to the lack of a knee joint which causes the limbs to project beyond the edge of a chair when the patient is in a sitting position. A partial compensation could be achieved by utilizing cosmetic limbs as suggested by Grynbaum and Gordon.[1] These would be appropriate on occasions when ambulation is not important.

Patients 1 and 2 did not become reconciled to the permanent use of stubbies, returned to the hospital and requested regular prostheses. These patients persisted in their request in the face of advice that regular limbs would entail long periods of rehabilitation, increase the hazard of falling, increase work load, and decrease endurance in ambulation. Both expressed a deep desire to use regular limbs. Patient 1 has been fitted with regular limbs about 4 inches shorter than his normal height and the knee joints equipped with locks. He is now independent in ambulation with crutches and will be discharged again to the community. His gait is obviously more labored and endurance considerably reduced, but the increase in morale has more than offset these losses. Our clinical judgment leaves the impression that, where prosthetic training is indicated, stubbies are to be initially employed. If the patient demonstrates the necessary skill and desire as in cases 1 and 2, regular limbs may be prescribed at a later date. In general, safety factors and reduced work load on the cardiovascular system are of the utmost importance in the elderly patient. For these reasons the stubby prostheses are likely to be permanent limbs for most elderly patients.

Wheelchair. Wheelchair prescription is of special importance in the double, above-knee amputee. Many of our patients were admitted in standard wheelchairs. The standard chair depends on the presence of the lower extremities for proper balancing. The amputee therefore is always faced with the danger of the chair tipping back with resultant trauma. The special amputee chair omits the foot rests (as unnecessary) and displaces the rear wheel back so that the chair is completely stable. If an amputee chair is not available, suitable weight (15-20 lb.) should be suspended from the front frame of the standard chair.

Physiological Observations

The double, above-knee amputee offers the opportunity to study the effect of amputations upon body function. The presence of such a large group of these patients at Coler Hospital has offered us

the opportunity to make several observations, which are reported in preliminary form.

Insulin Intake. Twenty-one of the 36 patients were diabetic. One question which was raised concerns the effect upon insulin requirements of removing a considerable mass of tissue. We recognize that insulin intake varies considerably and tends to decrease with age. Nevertheless, as a preliminary observation which we feel deserves further study, the changes noted in our patient group are worth reporting. Table 5 indicates the direction of change of insulin intake after the second amputation. In 15 patients where sufficient data are available, 7 discontinued insulin completely whereas they had had a previous intake ranging from 10 to 60 units. In four, the intake was decreased 5 to 45 units. Three patients increased their intake after the second amputation 5 to 35 units and one showed no change.

Table 5: Change in Insulin Dosage Following Second Amputation in 15 Cases

Change	No.	Remark
Discontinued	7	Previous Intake 10-60 units
Decreased	4	5-45 units
Increased	3	5-35 units
No change	1	——

The trend appears to be toward the decrease in insulin. Of course, the elimination of secondary infection at the site of gangrene may also account for this reduction.

Contractures. Positioning is properly considered to play a major role in the development of contractures. We were prepared to see significant contractures in our group since they all had been wheelchair-bound for years. A total of 30 patients was available for study. The most severe contracture was 40 degrees, with many having a contracture of 10 degrees or less. Of interest is the lack of correlation between the time of amputation and the development of contracture. One patient with 25 degree flexion contracture on the left hip had both amputations one year previously, and had no contracture in the right hip. On the other hand, many patients had no contracture or minimal limitations (5-10 degrees) after 10 or more years. Such discrepancies require further study. They do exemplify an observation expressed in a previous publication,[2] namely, that positioning is only one of many factors in the pathogenesis of contracture.

Vascular Adjustments to Postural Changes. The lower extremities are known to play an important role in cardiovascular adjustments during postural changes.[3] When erect position is assumed, pooling of blood is prevented by vasoconstriction in the lower extremities and the splanchnic area.[4] Normal subjects on being tilted to the vertical show a slight temporary rise of pulse rate and reduction of pulse pressure. We have studied this group of patients in order to evaluate the effect, if any, of the loss of both legs on the capacity for vascular adjustment, and the influence of ambulation training on vascular adjustments.

Evaluation of Vascular Adjustments

Three groups of male patients were observed: (1) five amputees involved in active rehabilitation, (2) five amputees on no exercise program, and (3) five nonamputees also on no exercise program.

The general nature of the three groups of patients was matched in terms of age, sex, blood pressure, and medical status. Patients with clinical cardiac disease were rejected.

The patients were allowed to rest one-half hour on the tilt table. Blood pressure and pulse rate were then observed at 5-minute intervals. A base line was considered achieved when two successive readings taken at 5-minute intervals were almost identical. Patients were then tilted rapidly to the vertical and blood pressure and pulse rate immediately noted and recorded repeatedly during the first and second minutes and again at 5-minute intervals until stabilization was achieved. The procedure was repeated on three separate days for each subject. The results (table 6) represent an average of 15 separate observations for each group.

The results show a close correspondence of cardiovascular reaction to posture change in groups I and III in terms of

Table 6: Pulse Pressure and Heart Rate (Supine and Erect) in Amputee and Control Groups

Group	No.	Heart Rate			Pulse Pressure		
		Supine	Erect	% Change	Supine	Erect	% Change
I Double, above-knee amputees in rehabilitation program ...	5	86	95	+10.0	62	51	—15.0
II Double, above-knee amputees on no exercise program	5	79	91	+20.0	76	79	+ 4.0
III Nonamputees on no exercise program	5	76	81	+ 7.0	61	54	—13.0

pulse pressure and pulse rate. Group II shows considerably greater increase in pulse rate (averaging 20 per cent higher than the resting rate) and an actual increase in the pulse pressure (averaging 4 per cent higher than resting pulse pressure). The increased pulse rate in this group is probably a reaction to a greater fall in cardiac output, which results from inadequate vascular adjustments to postural changes. The greater fall in cardiac output is compensated for by an increase in heart rate and systolic and diastolic pressures.

These observations have more than an academic value. From the effort point of view it is obvious that the patients in group II had a greater work load imposed on the heart because of their relative inefficiency in dealing with postural changes. The double, above-knee amputee who is on an exercise program responds to postural change in a manner similar to that of the nonamputee. The results provide support for maintenance exercise programs in the elderly, double, above-knee amputee in order to provide for a maximum cardiovascular efficiency.

Summary

Review of 49 elderly, double, above-knee amputees admitted to a chronic disease hospital reveals that: (1) there are a significant number of such patients in chronic disease institutions; (2) these patients are surviving at least 5 years beyond the second amputation; (3) rehabilitation with ambulation on pylons and regular limbs is a feasible goal for selected cases; (4) there are no fixed criteria for patient selection — patient's desire to ambulate may overcome handicaps of chronologic age, and associated medical conditions; (5) an opportunity for considerable physiological study is presented by these patients and preliminary observation had been reported in regard to insulin intake, contractures, and cardiovascular adjustment.

References

1. Grynbaum, B., and Gordon, E.: Rehabilitation of the Elderly Amputee. J. Chron. Dis. 4:292, 1956.
2. Lowenthal, M., and Tobis, J. S.: Contractures in Chronic Neurologic Disease. Arch. Phys. Med. 38:640 (Oct.) 1957.
3. Best, C. H., and Taylor, N. B.: The Physiological Basis of Medical Practice, Baltimore, The Williams & Wilkins Company, 1945.
4. Howard, P., and Leathart, G. L.: Changes of Pulse, Pressure and Heart Rate Induced by Changes of Posture in Subject with Normal and Failing Heart. Clin. Sc. 10:521, 1951.

Usefulness of Electromyography in Difficult Diagnostic Problems

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● The electromyograph continues to be a valuable instrument in the armamentarium of a physical medicine department for the diagnosis and differential diagnosis of many neurological conditions. When used frequently, diligently, and intelligently, electromyography will, in addition to the many well-recognized findings, also uncover certain unusual and unexpected findings which require interpretation. This paper includes a number of case histories and describes the unusual findings in each. It also attempts to explain the electromyographic observations thereby increasing the usefulness of electromyography to a greater field of indications. Included in the case reports are a case of familial periodic paralysis showing myotonic-like discharges in the recovery stage and also a case of myotonia diagnosed on the basis of the characteristic electromyographic which preceded the clinical observations of mechanical and electrical myotonic reactions by some time.

The frequent, diligent, and intelligent use of electromyography cannot fail to arouse the interest of the physiatrist who is willing to accept the challenge which this comparatively recent clinical instrument offers. At the present time the various machines available, though similar in basic electronics, differ in method of permanent recording. The most important criterion of an electromyograph, however, is to demonstrate visually and acoustically the actual electrical potentials present. The most important factor from the standpoint of the electromyographer is the interpretation of these actual electrical potentials.

The electrical silence at rest, the motor unit of minimal volition, and the interfering pattern of maximum volition of normally innervated muscle are now taken as a matter of fact. So, too, are the fibrillation and positive sharp wave voltages of denervated muscle, though the origin of the positive sharp wave has not yet been determined to the satisfaction of everyone. The complex polyphasic motor unit voltage of the degenerating and regenerating motor unit is also relatively easy to identify. The electromyographic sound and picture of myotonia is considered to be characteristic. The fasciculation or spontaneous motor unit voltage is easily determined to be present or absent. Somewhat more difficult to interpret are early cases of muscular dystrophy in which the dystrophic motor unit is not yet characteristic. The electromyographic records in myasthenia and Parkinsonism logically correlate with the clinical picture.

In addition to these common electromyographic observations there are bound to be other less common findings which are either unexpected or unusual. Such uncommon manifestations will be noted more often when electromyographic examinations are done almost routinely as a part of the neurologic examination in patients with obscure neurologic conditions or systemic diseases. In our hospital the physical medicine and rehabilitation service is called upon by all the other clinical services — neurology, neurosurgery, orthopedics, and medicine in particular — to perform electromyographic studies indicated.

The purpose of this paper is to present out of the large patient material a few case histories which have shown unusual or uncommon electromyographic findings, to attempt to explain these findings, and possibly to enlarge the applicability of electromyography.

Case Histories

Case 1. A 23-year-old white male was admitted to the neurological service with a diagnosis of hyperventilation syndrome on the basis of anxiety. During his hospitalization he was quite agitated and anxious. He stated that he was very "jumpy," especially if someone would come up behind him unexpectedly. On two occasions, when he had teeth extracted in the past, he had been unusually

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hyperactive coming out of nitrous oxide anesthesia. The patient stated that both on falling asleep and on awakening, many times he had felt his body jerk violently. He had had headaches for about three years prior to admission and it was about three years ago, on one occasion, when he lay down to rest, that he first noticed that his hands and wrists went into characteristic spasm. He had had several instances since that time of similar complaints and was observed on the ward to have typical tetany with carpal spasms controlled by breathing into a paper bag. Gradually the patient had become aware that these attacks occurred following deep breathing. He also observed that his hands and feet took on a purplish hue when cold.

There was a fine tremor of the extended hand. Electrical examination with galvanic and faradic test currents showed completely normal responses. Electromyographic examination of the forearm flexors showed complete electrical silence during relaxation and a normal pattern motor unit voltage on minimal volition.

The patient was then requested to breathe deeply for a period of 30 seconds. Following this period of hyperventilation there was some increase in base-line activity. This electrical activity was recorded as very low voltage activity, but otherwise the picture was of normal interfering pattern consistent with insufficient relaxation. The patient apparently was unable to relax this electrical activity.

The individual motor units of minimal volition became polyphasic and of increasing amplitude in the posthyperventilation period. However, these abnormal motor unit potentials could not be classified as giant motor unit voltages. No electromyographic evidence of denervated activity was recorded. The patient was later found to have a positive guinea pig test for tuberculosis and he was transferred to another hospital for treatment of that disease.

Comment. This case illustrates that electromyography is as useful in demonstrating an abnormal physiological state affecting the peripheral neurological system as it is in somatic diseases involving the lower motor neuron. However, unlike anatomical lower motor neuron lesions, denervation discharges in the form of fibrillation and positive sharp wave voltages were absent. Strictly psychogenic conditions such as psychoneurosis or hysteria fail to show any abnormal electromyographic findings, and a base-line disturbance in the latter cases is always associated with obvious failure on the part of the patient to relax. In this case, however, there was full cooperation and complete clinical relaxation which was associated with the base-line disturbance. Further we may hypothesize that the abnormal motor unit voltages as well as the base-line disturbance are the result of the effect of the alkalosis of the blood on the anterior horn cells. Speculation as to the role of calcium metabolism in tuberculosis as well as in parathyroid disease and the observance of the Chvostek sign in some cases of tuberculosis are beyond the scope of this paper.

Case 2. A 34-year-old white male war veteran first began to have symptoms referable to his neuromuscular system 14 years ago in the Army when his knees buckled while doing calisthenics. He was diagnosed as psychoneurotic and was excused from some of his basic training. However, he was assigned to a combat air crew and again became weak, shaken, and began to walk in a bizarre manner. He walked into the dispensary with an unstable gait and was transferred to the hospital in a highly excitable state, thrashing about on a litter. Later he reportedly lost the use of his legs. He was on a closed neuropsychiatric ward and was mute for a short time.

Neurologically he showed nystagmus, slurred and scanning speech, adiadochokinesis, weaving bizarre gait, diminished abdominal reflexes, moderate euphoria, and was unconcerned over his physical fate. His diagnoses at that time were multiple sclerosis, hyperinsulinism, and mental confusion. The hyperinsulinism was later found to be due to a pancreatic tumor which was removed.

His length of service was from February, 1943, until November, 1944, during

which he was stationed at camps in Florida, North Carolina, Massachusetts, and Georgia. He never went overseas and never was in an airplane crash, although he fabricated stories to include such events. One fabrication led to another to make a history from the patient completely unreliable. However, he did show, on physical examination, marked atrophy of the lower extremities, especially the lower legs. There was considerable weakness of the lower extremities and bilateral footdrop, which was more prominent on the right. Both lower legs showed stocking-type hypesthesia and there was impaired graphesthesia in the same area. His symptoms had been progressing for about three years prior to admission and he had several operations on his ankles and feet resulting finally in bilateral triple arthrodeses. On entry he was ambulating with a cane and long leg braces. There was full range of passive motion in both lower extremities except for the limitations of the triple arthrodeses. The upper extremities and trunk did not show any objective signs of disturbed function except for some atrophy of the dorsal interosseus muscles of the hands. The knee jerks were markedly diminished and the ankle jerks were absent. Hoffmann and Babinski signs were not present.

Electromyographic examination revealed evidence of marked and widespread denervated activity with active spontaneous fibrillation and positive sharp wave voltages. In some areas there were trains of high frequency potentials recorded that were of such frequency that the resultant sound on the loud speaker simulated the sound of a myotonic discharge (fig. 1). Motor unit voltages on minimal volition were of normal pattern. The first dorsal interosseus muscles also showed evidence of marked denervation, but here also the motor unit voltages were of normal pattern.

Comment. This case was later diagnosed as Charcot-Marie-Tooth disease or neuritic muscular atrophy. The psychiatric manifestations were considered to be a part of the disease. We feel that it is interesting to report because electromyography established evidence of an organic lesion involving the lower motor neuron when the psychiatric differential diagnoses were hysteria, malingering, and schizophrenia. In addition we feel that the electromyographic record of high frequency potentials simulating myotonia acoustically is interesting.

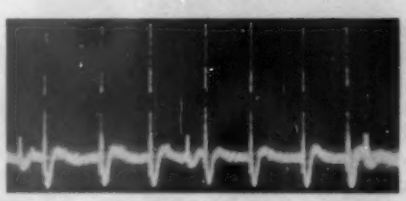

Fig. 1 — Case 2: Oscilloscopic picture of high frequency potentials in lower motor neuron disease (Charcot-Marie-Tooth disease). (Amplitude calibrated 100 μv to the inch, duration 30 milliseconds to the inch.)

Case 3. A 30-year-old white male was admitted to the neurological service because of complete paralysis of both lower extremities and partial paralysis of the upper extremities of 5 hours' duration. The patient's first such attack occurred at the age of 19 when, following a basketball game in the Navy, he felt tired and lay down to sleep. A few hours later when he awoke he found that he could move his arms and shoulders weakly. These symptoms began to improve after 24 hours. By the third day he was able to get out of bed and returned to duty on the eighth day. Subsequently he had had similar attacks at a frequency of about one a year. They generally occurred on awakening in the morning following a good night's sleep and usually were preceded by a day of excessive exercises. Between attacks he was in excellent health except that occasionally he would have " small spells of tightening-up of his hands and some cramp-like feeling in his abdomen" associated with "tightness and heaviness in his thighs and legs." He found out that by "walking off" or exercising he would be able to prevent a complete onset of paralysis.

The present attack was precipitated by excessive exercises in the form of swimming and walking during the day, followed by a period of limited food intake consisting of a sandwich and some beer. He returned from this excursion

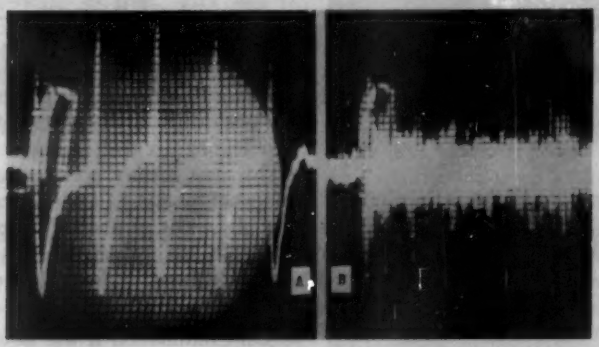

Fig. 2 — Case 3: Electromyographic picture of myotonia in the convalescent stage of familial periodic paralysis. (Amplitude calibrated 100 μv to the inch; duration: A, 30 millisecond = 1 inch; B, 1 second = 1 inch.)

and lay down to sleep. When he awoke a few hours later he found that his lower extremities were completely paralyzed without any pain or numbness or tingling.

The family history was vague since from the age of four he had been brought up by foster parents. However, the patient did know that his sister had some periodically recurring weakness of her legs during her adolescence.

Examination revealed the patient to be alert, oriented, cooperative and with no respiratory or speech difficulty. There was almost complete flaccid paralysis of all four extremities and neck. There was only some slight voluntary motion in the right upper extremity. Reflexes were markedly diminished to absent in all four extremities. Jaw reflex was 1+. Abdominal reflexes were absent; there were no sensory disturbances.

A diagnosis of familial periodic paralysis was made. Laboratory examination showed a white blood cell count of 20,000 with 81% polymorphocytes and 19% lymphocytes. Subsequently this dropped to 11,900 with normal differential. Normal values were obtained for hemoglobin, hematocrit, nonprotein nitrogen, creatinine, and fasting blood sugar. Serum sodium was 138 mEq. per liter and potassium was 3.9 mEq. per liter, which subsequently rose to 4.5 mEq. per liter. Total protein, albumin-globulin ratio and liver function tests were normal except for a cephalin flocculation test of 2+ in 24 hours and 4+ in 48 hours, which subsequently changed only slightly. Cerebrospinal fluid was normal with no cells, total proteins of 27 mg. per 100 cc., normal gold sol curve, and negative serology. A urinary 24-hour output for sodium was 40 mEq. per liter, and potassium 200 mEq. per liter. Creatinine was 4.0 mg. per cubic centimeter and creatine 1.3 mg. per cubic centimeter. Electrocardiographic and electroencephalographic findings were normal.

Electrical testing with galvanic and faradic testing currents on the day after admission while the patient was still at the height of his paralytic attack showed a virtually cadaveric reaction from the anterior tibials and extensors of the forearms. Stimulation of the remaining muscles produced normal responses. Four days later, after the patient had fully recovered clinically, the electrical test was repeated and the responses were normal, except that the thenar and interosseus muscles showed a decreased galvanotetanus ratio; responses did not last beyond the period of stimulation. However, clinically the thenar muscles showed a mechanical myotonic reaction which was still present 10 days later. The electromyographic examination at that time also presented the characteristic sound and oscilloscopic picture of myotonia (fig. 2). No evidence of denervation was elicited and motor unit voltages were of normal pattern.

Sixteen days later the patient no longer showed a mechanical myotonic reaction in the thenar eminences. He stated that he had previously noted that the last

symptom to disappear in each attack was weakness in his lower legs on walking, and he had now reached that stage in his convalescence. However, in spite of the fact that a mechanical myotonic reaction could not be demonstrated in the thenar muscles, electromyographic examination still revealed its presence. Electromyographically the myotonic response was sustained for an even longer duration in the anterior tibial muscles. Six months later the patient had another spontaneous attack of muscle paresis which aborted following intake of orange juice. Again electromyography was performed during the attack and fibrillation voltages were observed in the anterior tibial muscles in addition to the myotonic picture. Also the galvano-tetanus ratio was again decreased. Galvanic-faradic testing showed weak normal responses but no reaction of degeneration.

Comment. This case presents the unusual finding of myotonic-like discharges demonstrated electromyographically in the convalescent phase of familial periodic paralysis. Similar findings have also been observed by Shea, Woods, and Tratar[1] in a case of spinal cord trauma causing temporary paralysis which cleared after 10 minutes. In another case of familial periodic paralysis observed by us and examined during an attack induced by an infusion of glucose, a cadaveric response was elicited on galvanic-faradic testing but a similar myotonic-like picture was not seen.

We believe that the above-described myotonic-like discharges may be related to fast repetitive motor unit discharges since any regular wave of sufficiently high frequency will result in a characteristic tone, the purity of which will be determined by the regularity of the waves and the pitch by their frequency.

Case 4. A 35-year-old white male was admitted with a chief complaint of weakness of his extremities. He first noted onset of his symptoms while in service in 1942 when he had progressive difficulty in drilling, hiking, and carrying a full field pack. After discharge from the service he worked in shoe factories where he had to continually shift from one job to another requiring less standing and less strength in his hands. Finally he reached a point where he was unable to work at all. He stated that he had periods when he experienced difficulty in releasing his grasp on objects. Review of his past history revealed abnormality of sexual function manifested by testicular atrophy, poor to absent libido, marriage at age 20 but with permanent separation six weeks later. Patient's baldness started at the age of 21.

On examination it was noted that the patient walked with a shuffling gait. There was atrophy of the temporal, masseter, and sternocleidomastoid muscles bilaterally. There was generalized weakness of all his extremities. The deep tendon reflexes could not be elicited. Electrical testing and electromyography were done on the third hospital day. Electrical responses to both faradic and galvanic currents in all muscles tested were normal. There was no mechanical nor electrical myotonic reaction obtainable. In spite of this the electromyogram showed a characteristic pattern of myotonia. On the 51st hospital day, physical examination showed the presence of a slight mechanical myotonic reaction and an electrical myotonic reaction was elicited in both thenar eminences.

Comment. The patient noticed that the phenomenon of delayed grasp release was variable and more pronounced during cold weather and on arising in the morning. The first electromyographic examination showed the characteristic sound and oscilloscopic picture of myotonia in the absence of mechanical and electrical myotonic reaction. Therefore, electromyography in this case helped to establish the clinical diagnosis of myotonia dystrophica several weeks before other findings made the diagnosis certain.

Case 5. A 35-year-old housewife was admitted with a chief complaint of infected ulcers of the legs. She had always enjoyed good health until February, 1953, at which time she noted pain and weakness in both wrists as well as occasional discomfort in the calves of her

legs on exposure to cold. Her fingers and toes became cold, numb, and painful, and they blanched on exposure to cold. A diagnosis of Raynaud's disease was made, but a trial with tolazoline (Priscoline) offered no relief.

In June, 1953, the patient noted for the first time several small, very painful ulcerations on both ankles which healed spontaneously. Soon thereafter, in the fall of 1955 with the onset of cold weather, she noted that the skin of her lower extremities would become mottled and bluish on exposure to cold and the small ulcerations reappeared. Bilateral sympathectomies resulted temporarily in complete remission of all signs and symptoms. However, in March, 1956, she was rehospitalized because of return of her symptoms and infected ulcerations.

Routine x-ray and intensive laboratory studies were negative except for presence of cryoglobulin in her blood. She was started on prednisone (Meticorten) on this admission and experienced some improvement. In July, 1956, she was admitted to another hospital for further diagnostic studies, all of which proved negative except for the continued presence of cryoglobulin. A skin and muscle biopsy, however, showed "necrotizing vasculitis." While the patient was in the hospital, her right middle and index fingers became cyanotic, swollen, and numb. Several days later the tips of these fingers became gangrenous.

She was admitted to our hospital in October, 1956. At that time her head, eyes, ears, nose, throat, lungs, heart, and abdomen were examined and were within normal limits. The skin of her lower extremities from midthigh down was blotchy, bluish, mottled, and covered with large irregular areas of brownish pigmentation. Many red and bluish-red areas were present on the outer aspect of the left knee, and along the pretibial areas bilaterally to the ankles. There were several shallow ulcerations over the area of both ankle joints. Peripheral pulsations were of good quality. The right middle finger was black from the proximal interphalangeal joint distal, and sloughing of the soft tissue was taking place (fig. 3). There was diminished sensation to pinprick and touch in both lower extremities up to the lower third of the tibia, and in the upper extremities on the ulnar surfaces of the wrists. There was some atrophy of muscles of both hands and legs.

Fig. 3 — Case 5: Lower extremities showing skin lesions in necrotizing vasculitis. Photo taken 5 months before patient died.

Extensive diagnostic laboratory and x-ray procedures were again carried out. All tests were negative except for x-ray evidence of some demineralization of the bones of the hands and feet, and also an abnormal electromyogram.

The electromyographic examination revealed normal findings in the left quadriceps muscle. There were polyphasic motor units observed in the left flexor carpi ulnaris muscle. Only one area was explored in the left anterior tibial muscle since it was deemed advisable to limit the number of skin punctures because of the extensive involvement of the skin of the lower extremities.

During relaxation there were active spontaneous fibrillations and positive sharp wave voltages in virtually all areas explored with the needle electrode through the single puncture point. The discrete motor unit voltages on minimal volition showed low voltage and a complex polyphasic pattern. On maximal effort, mean voltages were consider-

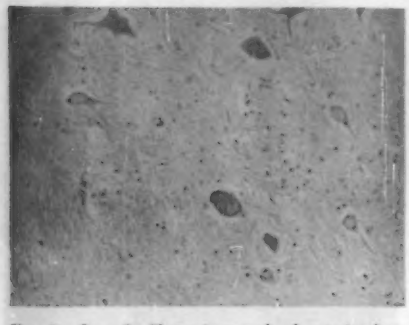

Fig. 4 — Case 5: Photomicrograph of anterior horn of spinal cord in necrotizing vasculitis showing axonal reaction of some of the anterior horn cells.

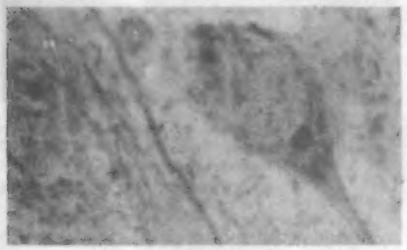

Fig. 5 — Case 5: Photomicrograph (enlarged from fig. 4) showing chromatolysis of anterior cell.

ably less than normal. To explain the lower motor neuron lesion, the consultant in neurology suggested a polyneuritis probably secondary to a vascular disease of unknown cause.

In mid-February, 1957, the patient complained of abdominal pain, and her subsequent hospital course was steadily downhill. She developed uremia and expired on April 9, 1957. At autopsy grossly there was pulmonary congestion and edema, left and right ventricular hypertrophy, and bilateral nephropathy. There were many lesions of the small vessels of the pia mater showing peculiar verrucous formation with occlusion of the vessel from that point on. Microscopically there were many lesions of the small renal vessels which looked like a "burned out arteritis." Unfortunately, no specimen of a peripheral nerve was taken. However, the anterior horn cells of the spinal cord showed central chromatolysis (figs. 4 and 5), which is seen characteristically in peripheral nerve destruction or disease. The vascular lesions found microscopically were similar to those reported in scleroderma.

Comment. This case illustrates the finding of denervated activity in a patient with an obscure collagen disease which resembles scleroderma microscopically. The denervated activity is the result of a peripheral neuropathy secondary to a necrotizing vasculitis.

Summary

Five case histories are presented in which the electromyographic findings are interesting or unexpected. The electromyographic findings are described and interpreted in the light of the clinical course. The cases include one of hyperventilation syndrome; one of familial periodic paralysis showing a myotonic-like reaction in the convalescent stage; one of Charcot-Marie-Tooth disease in which an organic lesion of the lower motor neuron was demonstrated at a time when various psychiatric diagnoses were being considered and in which trains of high frequency potentials simulated myotonia; one of myotonia dystrophica in which the electromyogram established the diagnosis several weeks prior to the appearance of either the mechanical or electrical myotonic reaction; and finally one of a collagen disease with peripheral neuropathy on the basis of a necrotizing vasculitis confirmed by autopsy findings.

The authors are indebted to John D. Houghton, M.D., Chief of Laboratory Service, VA Hospital, for making available the autopsy report and histological slides.

Reference

1. Shea, P. A.; Woods, W. W., and Tratar, A. A.: The Myotonias; An Electromyographic Study, with Special Reference to Myotonia Acquisita. A.M.A. Arch. Neurol. & Psychiat. 68:794 (Dec.) 1952.

Preliminary Report on Neuromuscular Function Testing of the Upper Extremity in Adult Hemiplegic Patients

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• A measurement of return of motor function following hemiplegia is described. This test utilizes the basic synergies of motion of the upper extremity, observed in extensive upper motor neuron disease. The background for its use follows the development of progressive functional activities out of the synergies described. Its advantage over standard muscle testing procedures has been discussed. It would also be desirable to stimulate further exploration of better methods of evaluating these poorly understood responses in both the upper and lower extremities in all areas of upper motor neuron disease, so that therapeutic technics utilizing such responses may likewise be more effectively evaluated.

In observation of the return of function in hemiplegic patients, most of us have realized the inadequacies of standard testing technics. Heretofore, the most commonly used method of grading has involved the well-known muscle test devised by Daniels, Williams, and Worthingham.[1] This test was a revision and standardization of methods previously used. These technics have proved useful in the evaluation of lower motor neuron disorders as well as of intrinsic muscle disease. However, the multiple factors involved in motion following upper motor neuron lesions, such as occurs in the hemiplegic patient, cause extreme difficulty in attempts at standardizing any type of testing procedure.

Observations of motor behavior have stimulated interest in the clinical application of therapeutic technics to facilitate restoration of function in upper motor neuron disease.[2-9] Many of the neurophysiologic mechanisms involved in the complex responses following upper motor neuron insult have been elucidated.[10-14] A considerable interest in the clinical application of reflex responses and neuromuscular facilitation has demanded an attempt at measurement of functional restoration in this type of patient. Such measurement is essential in analyzing the benefits derived from these technics compared to the results obtained when patients receive other types of conventional therapy or remain untreated.

New Muscle Testing Procedure

Our observations of the motor function of patients with hemiplegia have compared closely with the so-called "associated reactions" studied by Simons[3] and with the movement synergies in spontaneous return as described by Twitchell.[4] In attempting to evaluate progress, it immediately became obvious that certain inherent difficulties in standard testing procedures have interfered with uniform objective measurement of functional return. We are here presenting a test form for the upper extremity which we have found useful in evaluating our hemiplegic patients, some of whom have been subjected to the previously mentioned type of training.

Many problems are encountered in the standard muscle testing procedure when applied to hemiplegic patients. The grading used in this method of testing is based on whether a muscle can perform with gravity eliminated, against gravity, or against gravity plus manual resistance, and it is assumed that individual muscles or muscle groups can be tested separately. Furthermore, full range of motion has been a criterion for progression in grading. However, in the hemiplegic patient multiple factors, such as spasticity, the influence of posture, of activity in other parts of the body, of righting reactions, of tonic neck and labyrinthine reflexes, and of the grasp reflex, have defied objective measurement. It has often been observed that action against gravity and/or resistance

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Fig. 1 — Testing elbow extension, grade "poor." *A*, Conventional starting position is demonstrated on the normal side. The involved extremity does not tolerate such a starting position. *B*, Starting position, patient seated. Arms are supported in abducted position, elbows flexed. *C*, Normal arm has completed elbow extension. *D*, Affected arm does not respond; voluntary attempt at extension of the elbow results in a forward movement of the entire limb.

may assist rather than inhibit the responses of hemiplegic patients. Therefore, gravity and resistance as used in the standard muscle test cannot be factors of measuring progress, as resistance frequently seems to reinforce the strength of the response by stimulation of sensory receptors. It may then be seen that strength, per se, should not be a criterion for grading, and that standard muscle testing has little meaning.

An example of how a misleading response to the present standard of testing may be obtained will now be described. A typical patient is tested for elbow extension, and it will be shown that the triceps does not in all respects meet any of the standard grades.

Testing for "Poor." For the grade "poor," elbow extension is carried out in the horizontal plane so that the action of gravity is eliminated. Friction is reduced by using a smooth surface, such as a powdered board. The patient may be tested in the supine position or sitting. In the supine position, the arm is abducted 90 degrees and the elbow is flexed, with both arm and forearm resting on the table, as demonstrated by the patient's normal (right) arm (fig. 1*A*). It is impossible, however, for this patient as for most hemiplegic patients, to have the affected arm placed in the starting position — note the involved left arm (fig. 1*A*).

When the sitting position is used, the upper extremities are supported on a horizontal board with the arms abducted and the elbows flexed (fig. 1*B*). Elbow extension is carried out by sliding the forearm on the board as demonstrated by the normal side (fig. 1*C*). When the same movement is attempted on the involved side, the forearm does not respond; instead, the upper arm is drawn forward by the action of the pectoralis major, which may be seen to contract vigorously (fig. 1*D*).

According to the standard muscle test, it is thus seen that the triceps does not meet the grade "poor" in either of the two testing positions.

Testing for "Fair." This grade requires that elbow extension be performed against gravity. The supine, prone, or sitting position may be employed. When the prone position is chosen, the forearm is allowed to hang over the edge of the table, as seen in figure 2*A*. Voluntary attempt at elbow extension only results in increased tension in the *flexors* of the elbow (fig. 2*B*). On the other hand, if the supine position is chosen (fig. 2*C*) the patient succeeds in extending the elbow full range (fig. 2*D*). In sitting (starting position, hand on top of head), success or failure of elbow extension may depend upon whether the head is ro-

Fig. 2 — Testing elbow extension, grade "fair." *A*, Prone position, elbow hanging over edge of table. *B*, Voluntary attempt at extension of the elbow results in increased tension in the flexors of the elbow, elbow extension is inhibited. *C*, Supine starting position. *D*, Patient succeeds in extending the elbow full range.

tated toward or away from the affected side.

In the prone position, then, the triceps does not meet the grade "fair," while in the supine position the grade would be "fair" or better.

Testing for "Good." The positions for testing are the same as for "fair." To qualify for the grade "good," the muscle must be able to perform against gravity plus added resistance. Manual resistance is usually employed, but for the purpose of the illustration, a 3-pound dumbbell was strapped in the patient's hand, the supine position being used (fig. 3*A*). With this weight resisting the movement, the patient performed complete elbow extension, as seen in figure 3*B*. On the

Fig. 3 — Testing elbow extension, grade "good." *A*, Supine starting position. *B*, Patient extends the elbow against the weight of the forearm and an additional resistance — three pounds strapped to the hand.

Fig. 4 — Typical basic movement synergies of hemiplegic patients. *A*, Flexion synergy, involving elevation and retraction of the shoulder girdle, abduction and external rotation of the arm, flexion and supination of the forearm. *B*, A common variety of the flexion synergy. Hyperextension of the arm replaces abduction and external rotation. *C*, Extension synergy, involving adduction and internal rotation of the arm, extension and pronation of the forearm.

other hand, if the prone position was employed (fig. 2*D*), this patient's elbow extension was completely inhibited.

Because of the complexity of influencing factors which differ in each testing position, it is not feasible to use the standard positions of the conventional muscle test. As a matter of convenience it is therefore suggested that all testing of the upper limb be done with the patient in the sitting position as this is the most important position for function. Furthermore, muscles and muscle groups must be tested as components of mass movements rather than as isolated units, and this particularly holds true in patients with severe involvement.

The mass movements commonly observed in patients with hemiplegia have been referred to as synergies of flexion and extension.[2-5, 15] The flexion synergy is characterized by elevation and retraction of the shoulder girdle, abduction and external rotation of the arm, and flexion and supination of the forearm (fig. 4*A*). Frequently, hyperextension of the arm replaces abduction and external rotation (fig. 4*B*). In the extension synergy, there is some protraction of the shoulder girdle, marked adduction and internal rotation of the arm, and extension and pronation of the forearm (fig. 4*C*). It is to be noted that no mention is made of the positions of the wrist or the fingers, for the response is not constant with either of these synergies. However, this factor does not limit the use of the testing procedure here described, for the evaluation of the wrist and hand is considered as a separate portion of this test.

New Test Form

The test form for the upper extremity which is here presented has been developed during a period of over five years. Three other forms have preceded it; this last (fourth) version represents, in our opinion, a usable although by no means a perfect form.

During the last 16 months, 74 patients have been studied and tested according to one or the other version of the form. The last form has been applied to 18 patients and found to meet most of the requirements. The majority of the patients studied have also been subjected to the standard muscle testing procedure without any correlation of functional results. It is not our purpose to comment on the level of function of the patients tested or to describe the extent of their disease. We are only presenting a dynamic and functional measurement of the patient's progress, irrespective of therapy or its absence. Other testing procedures have been described by Dinken[16] and by Yamshon and associates.[9] In the latter, the test was limited to elbow extension, and that not within the synergies or planes here described.

Our proposed measurements go into considerable detail. A previous report

HEMIPLEGIA - CLASSIFICATION AND PROGRESS RECORD

Shoulder and Elbow (tested in sitting position)

Name _____ Age ___ Date of onset _____ Side affected _____

Essentially flaccid ____ spastic ____ pos. sense _____

1. NO VOLUNTARY MOVEMENT INITIATED Date _____ _____

2. SYNERGIES (OR COMPONENTS) APPEARING, MINIMAL RESPONSE ON VOLUNTARY ATTEMPT (describe:)

Date _____ Flexion synergy _____

Date _____ Extension synergy _____

3. BOTH SYNERGIES OR SOME COMPONENTS INITIATED VOLUNTARILY

		Date	range, no facilit.	range w. facilit.	type of facilit. employed	Date	range, no facilit.	range w. facilit.	type of facilit. employed
Flexion Synergy									
Shoulder girdle	Elevation								
	Retraction								
Arm	Abduction								
	Ext. Rotat.								
Forearm	Flexion								
	Supination								
Extension Synergy	Shoulder, mainly pec. major								
	Elbow Extension								
	Pronation								
4. MOVEMENTS DEVIATING FROM BASIC SYNERGIES Extension or elbow	arm elevated above horiz.								
	arm backward								
	elbow straight								
	obliquely sideward								
	obliquely upward								
Elbow at 90 degrees	Pronation								
	Supination								
5. RELATIVE INDEPENDENCE OF BASIC SYNERGIES	horiz. abduction elbow extension								
	supination, arm side - horiz.								

6. RECIPROCAL MOVEMENTS AND SPEED TESTS (Strokes/5 sec.)

	Date		
"Drumming" (w. closed fist)			
Hand from lap to chin	Normal		
	affected		
Hand from lap to opposite knee	Normal		
	affected		

oo Range is estimated and recorded as 0, 25%, 50%, 75% & 100%, as compared to unaffected side.

Note: for abbreviations of type of facilitation, see page 2.

Fig. 5 — Testing chart for the upper extremity, upper motor neuron lesions (adult hemiplegic patients). Left, shoulder girdle, arm, and forearm; right, wrist, fingers, and thumb.

HEMIPLEGIA - CLASSIFICATION AND PROGRESS RECORD

Hand (tested in sitting position)

Date

Hand predominantly flaccid _____ Spastic _____

Pos. of wrist, thumb, & fingers: (1) at rest _____

(2) Flex. syn. _____

(3) Ext. syn. _____

Position sense _____

Finger tip recognition _____

WRIST:

Extension w. fixation for grasp — ext. syn. _____; flex. syn. _____; any position _____

Flexion _____

Circumduction _____

FINGERS AND THUMB: 1. NO VOLUNTARY MOVEMENT INITIATED _____

2. HOOK GRASP: brief-case handle placed in hand _____

3. LATERAL PREHENSION: paper betw. thumb & index* _____

4. PALMAR PREHENSION: pen in position for writing* _____

5. TIP PREHENSION: pick up bead* _____

6. SPHERICAL GRASP: grasp ball* _____ catch underhand ___ overhead ___ throw ___

7. EXTENSION: (describe) _____

8. INDIVIDUAL FINGER MOVEMENTS: "typing" motion _____

9. FINE COORDINATION: (a) button & unbutton shirt _____

(b) use thumb tacks _____

*Grasp and release

Abbreviations indicating type of facilitation, etc.

HRR	head rotated right	HAP	held after positioning
HRL	head rotated left	MES	muscles in elongated state
HF	head forward	RES	resistance
HB	head backward	BIL	bilaterally
TF	trunk forward		
TB	trunk backward	d	difficulty
AOH	arm over head	awk	awkward
ST.R.	stretch reflex	mcc	marked concentration
SSS	sensory surface stimulation	ml	marked latency
FS	forearm supinated	tr	tremor
FP	forearm pronated	cl	clonus

of a more gross evaluation has been described by one of us (S. B.).[15] This gross testing mechanism was utilized in the evolutionary development of the present form. It should be recognized that the present test relies heavily on a type-specific progression of functional activities. This is particularly observed in the section on the hand, whereas the section on the shoulder and elbow emphasizes the control of movement, first as components of the typical hemiplegic movement synergies, then independently of these.

The test is divided into two portions as previously mentioned, involving (1) the shoulder, arm and forearm; and (2) the wrist and hand.

Fig. 6 — Progressive levels of function of the hand. *A*, Hook grasp — the handles have been placed in patient's hand. The grasp is maintained, but patient cannot release. *B*, Lateral prehension — patient holds paper between thumb and lateral part of index finger. On affected side he cannot avoid strong flexion at interphalangeal joint of thumb. Release of paper is awkward. *C*, Palmar prehension is demonstrated on normal (right) side. A pen has been placed in the affected (left) hand. Patient is unable to grasp the pen or to hold it correctly. *D*, Tip prehension (grasp of bead) is demonstrated on the normal side. Affected hand cannot duplicate movement. *E*, Spherical grasp is demonstrated on the normal side. A ball has been placed in the patient's left hand, but the ball is not grasped correctly and patient is unable to release.

The first section consists of six levels of achievement (fig. 5, "page 1"). Level 1 indicates no initiation of voluntary movement. Level 2 determines the early components of the movement synergies when they first start to appear. Level 3 measures active range at various joints, these joint movements appearing as components of the flexion and extension synergies. Separate columns are provided to indicate the effect on range of various types of facilitation (abbreviations are explained at the bottom of the second page). On Level 4 certain movements which deviate from the basic synergies are tested. These movement combinations were selected because they represent specific progress beyond Level 3. The movements tested on Level 5 are those which require relative independence of the basic synergies. Level 6 measures more complex functions requiring a higher integrated control. The speed of a selected reciprocal movement ("drumming") is recorded, a stop watch being used for exact determination. Two other speed tests, one requiring complete elbow flexion, the other complete elbow extension, are given and the involved side is compared in time with the uninvolved extremity. The speed tests indicate the degree of return of reciprocal innervation, as even a small amount of spasticity has a delaying effect on the movements.

The second section of the test deals with control of the wrist, fingers, and thumb (fig. 5, "page 2"). Fixation of the wrist in extension, such as is needed when the hand is used for grasping, is considered a most important function, and is therefore tested in several positions. Hand activity is divided into nine groups. Because functional achievements of the hand are determined by the relationship of the thumb to the fingers and the palm,[17] the first six groups measure progressive levels of this function (fig. 6). It should be noted that all of these categories for the hand are correlated to a specific functional type of motion; for example, number four, Palmar Prehension, is measured by grasping a pen in position for writing and release of the same object. Number seven describes extension, if any, elicited reflexly or performed voluntarily. The extension reflex response may occur at any time during the recovery period. Numbers eight and nine are examples of the most advanced hand activities which a hemiplegic patient might be expected to perform.

In the sixth stage of the shoulder and elbow gradation and in the more advanced categories of hand activities, the standard muscle test may occasionally be of some value in determining strength components.

One will readily recognize that though a classification of progress is suggested, the actual degree of recovery may proceed through a long interval in one grade, while being very short in another. Also, there may occasionally be some overlapping in gradation of function.

It is realized that the test here presented does not in every respect meet the desired criteria of objectivity, reliability, and validity, a shortcoming, however, which it shares with most clinical tests. Nevertheless, we feel that the test sheet in its present form may well serve as a graphic guide to a particular patient's status or progress.

Summary

A measurement of return of motor function following hemiplegia is here described. This test utilizes the basic synergies of motion of the upper extremity, observed in extensive upper motor neuron diseases. The background for its use follows the development of progressive functional activities out of the synergies described. Its advantage over standard muscle testing procedures has been discussed.

It would be highly desirable to stimulate further exploration of better methods of evaluating these poorly understood responses in both the upper and lower extremities in all areas of upper motor neuron disease, so that therapeutic technics utilizing such responses may likewise be more effectively evaluated.

References

1. Daniels, L.; Williams, M.; and Worthingham, C.: Muscle Testing: Techniques

of Manual Examination, ed. 2, Philadelphia, W. B. Saunders Company, 1956.
2. Riddoch, G., and Buzzard, E. F.: Reflex Movements and Postural Reactions in Quadriplegia and Hemiplegia. Brain **44**:397 (Jan.) 1922.
3. Simons, A.: Kopfhaltung und Muskeltonus. Ztschr. Neurol. u. Psycho. **80**:499, 1923; abstracted in Phys. Therapy Rev. **33**:409 (Aug.) 1953.
4. Twitchell, T. E.: Restoration of Motor Function Following Hemiplegia in Man. Brain **74**:443 (Dec.) 1951.
5. Walshe, F. M. R.: On Certain Tonic or Postural Reflexes in Hemiplegia, with Special Reference to So-Called Associated Movements. Brain **46**:1 (May) 1923.
6. Fay, T.: Use of Pathological and Unlocking Reflexes in Rehabilitation of Spastics. Am. J. Phys. Med. **33**:347 (Dec.) 1954.
7. Kabat, H.: Central Mechanisms for Recovery of Neuromuscular Function. Science **112**:23 (July 7) 1950.
8. Hellebrandt, F. A.; Houtz, S. J.; Partridge, M. J.; and Walters, C. E.: Tonic Neck Reflexes in Exercises of Stress in Man. Am. J. Phys. Med. **35**:144 (June) 1956.
9. Yamshon, L. J.; Machek, O.; and Covalt, D. A.: Tonic Neck Reflex in the Hemiplegic. Arch. Phys. Med. **30**:706 (Nov.) 1949.
10. Sherrington, C. S.: Integrative Action of the Nervous System, New York, Scribner, 1906.
11. Bieber, I., and Fulton, J. F.: Relation of Cerebral Cortex to Grasp Reflex and to Postural and Righting Reflexes. Arch. Neurol. & Psychiat. **39**:433 (Mar.) 1938.
12. Magnus, R.: "Haltung" in Körperstellung, Berlin, Springer, 1924, chap. III, abstracted in Phys. Therapy Rev. **33**:281 (June) 1953.
13. Denny-Brown, D.: Disintegration of Motor Function Resulting from Cerebral Lesions. J. Nerv. & Ment. Dis. **112**:1 (July) 1950.
14. Travis, A. M., and Woolsey, C. N.: Motor Performance of Monkeys After Bilateral Partial and Total Cerebral Decortications. Am. J. Phys. Med. **35**:273 (Oct.) 1956.
15. Brunnstrom, S.: Associated Reactions of Upper Extremity in Adult Patients with Hemiplegia: An Approach to Training. Phys. Therapy Rev. **36**:225 (April) 1956.
16. Dinken, H.: Evaluation of Disability and Treatment in Hemiplegia. Arch. Phys. Med. **28**:263 (May) 1947.
17. Schlesinger, G.: Der mechanische Aufbau der kunstlichen Glieder, in Ersatzglieder und Arbeitshilfen, Berlin, Springer, 1919.

we meet . . .

in philadelphia . . .

in 1958 . . .

36th Annual Session, American Congress of Physical Medicine and Rehabilitation, Philadelphia, Hotel Bellevue Stratford, August 24-29, 1958.

Use of Portable Standing Beds in the Care of Long-Term Disabled Patients

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● Portable standing beds that are fabricated by the PM&R Service are utilized throughout this general medical and surgical hospital in the treatment of long-term disabled patients. This standing bed is quite similar to those commercially available but with additional modifications. This paper will outline in more detail our program in the utilization of this bed in its entire concept, various modifications and attachments.

In a large general hospital of a medical center with many recognized specialties of research and training, there is a large referral from widespread areas with a resultant increased demand for care of long-term, severely disabled patients. This category consists of patients with quadriplegia, paraplegia, severe neurological disorders, open or closed head injuries, and other catastrophic illnesses.

Concomitant with the care of these patients are the problems of osteoporosis, decubitus ulcers, recurrent genitourinary infections, ankylosis, and contractures of joints, as well as psychological depression, rejection, and dependency occurring with long-term hospitalization. Such factors indicate early upright standing positions as soon as medically advisable in order to prevent the usual complications secondary to prolonged bedrest.

Another problem is that the number of stationery standing beds in clinic facilities is inadequate to provide sufficient elevated up-time for a large group of patients. The patients have to be brought from the nursing ward to the clinic, then transferred by aide personnel from the litter or wheelchair to the standing bed.

Thus, with these problems, our rehabilitative staff saw the feasibility and medical use of a functional portable standing bed. Such a bed can be available on the nursing ward and, according to the patient's schedule, in varying clinics. He can then be placed on the portable standing bed by the ward aide or nurse and pushed to the scheduled clinical activity. The patient gains several hours of "standing time" in his therapeutic regimen of occupational therapy, physical therapy, manual arts therapy,

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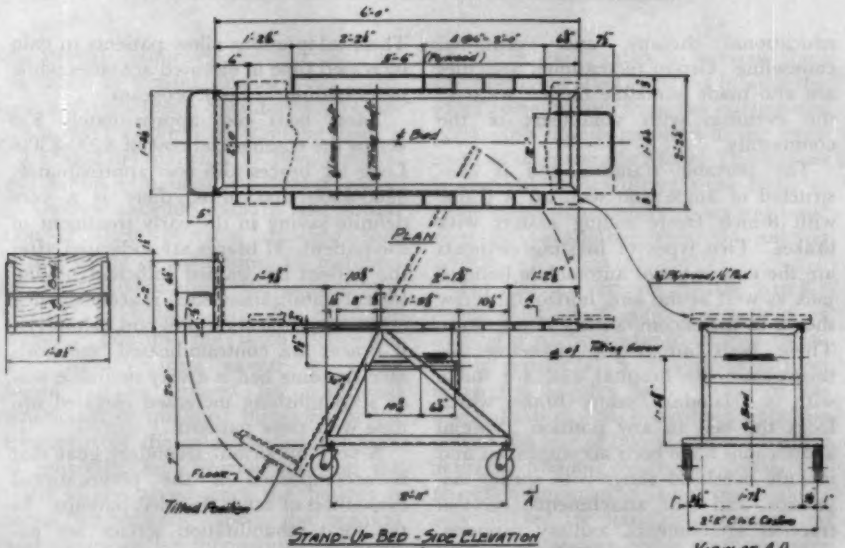

educational therapy, and vocational counseling. Group recreational activities are also made available on the ward in the evenings with volunteers of the community.

The portable standing bed is constructed of angle iron with an A frame with 8-inch freely rolling casters with brakes. Two types of hoisting elements are the conventional automobile bumper jack as well as the long horizontal screw shown in the accompanying illustrations. These beds are easily maneuverable throughout the hospital and are stable with a secondary safety brake which locks the bed in any position. Special adaptations have been accomplished and include overhead slings with spring suspension and cuff attachments, cervical traction attachments, axillary supports, arm rests, and a variable height table. These adaptations allow patients to gain increased time in elevated activities while participating in their program.

These beds cost approximately $50 versus the commercial cost of $200-$300. Long leg braces also cost approximately $200-$300 and, thus, there is a very definite saving in the early treatment of the patient. If braces are indicated after the patient has gained sufficient physiological stabilization, such is accomplished in the hospitalization program. However, if braces are contraindicated, the portable standing bed is a very desirable way of accomplishing increased elevated uptime with these patients.

A very important secondary goal that is accomplished is the prevocational evaluation of other disabled patients. In the total rehabilitation service are patients who need, as recommended by the

vocational counselor, prevocational exploration in drafting, metal work, welding, and upholstery. Such medical equipment as the portable standing bed is fabricated by patients in prevocational evaluation in manual arts therapy.

Another tangible gain in the utilization of these portable standing beds is the saving of man-hours by members of the rehabilitative staff, since the patient is placed on the portable standing bed by the ward personnel. The money thus saved in man-hours can be utilized for additional equipment or qualified therapists in the treatment of the total patient program of rehabilitation. Nursing time on the ward is also saved since the patient is more "ambulatory" about the hospital and clinics in his therapeutic program. The patient's up-time is greatly increased, which, in itself, tends to prevent those complications often inherent in such disabled patients and, thus, less nursing and physician's time is required in the treatment of such complications. The patient is also able to go direct from clinic to clinic rather than return to his ward and then go to another area via another vehicle.

The patient receives specific psychological support through this activity in that he is participating in various therapeutic programs. Such support is most important in the early phase of his hospitalization. Such elevated activities reduce the fear of falling and are helpful in preconditioning for crutch ambulation. If crutch ambulation is not feasible and only utilized for standing activities, the use of the standing bed is good and prevents that "false motivation" within the

patient that fitting with braces often instills, that is, "that he will walk again," and that prevents the patient from partaking in a realistic fashion in total rehabilitation.

Summary

The portable standing bed and its utilization in the rehabilitation of long-term severely disabled patients is discussed.

The Wheelchair Fender Drive

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● The construction, arrangement, and usage of the wheelchair fender drive is described. This product was designed by the Physical Aids Development Society which is dedicated to the design and construction of apparatus and equipment to help physically handicapped patients.

The activities involved in propelling a wheelchair can roughly be divided into two categories: (1) The act of pushing or thrusting the wheels forward, and (2) the act of returning the hands to the original position. The Wheelchair Fender Drive attachment was designed and developed primarily to accomplish the latter act.

Let us assume that the act of pushing or thrusting the wheels can be accomplished without any significant difficulty. The problem remaining is to bring the arms back to a position from which the second stroke may be applied. The Wheelchair Fender Drives are simply additional rims which are independent and concentric to the wheels of the chair. These additional rims or fenders (*A*, figs. 1 and 2) are spring loaded to return them to the starting position. The patient grasps the fenders and the wheel rims simultaneously. The slight pressure of the grasp will bend the spider arms (*B*, figs. 1 and 2) slightly, and the fender will make contact with the rubber tire of the wheel by means of two friction points located on the underside of the fender.

The fender fixes to the tire in two ways: (1) by direct contact of the hand on the wheel rim and fender, and (2) by the pressure of the contact points on the tire of the wheel. The patient then thrusts forward to propel the wheelchair. At the end of the stroke, he releases his grasp, which disengages the fender from the wheel. The spring mountings (*C*, figs. 1 and 2) return the fenders to the starting position and, since the hands are still resting on the fenders, they are also brought back to the starting position. The

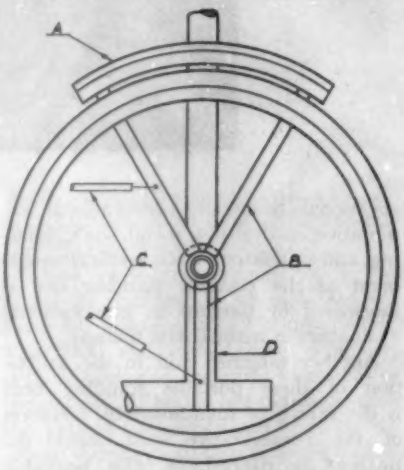

Fig. 1 — Components and arrangement of parts of Wheelchair Fender Drive. A, Fender with large inner and smaller outer curved arc; B, semirigid spider arms arranged in the form of a "Y" and attached to a central collar which fits over the axle of the wheelchair; C, springs or elastic bands employed to return fender drive to resting or starting position; D, frame of wheelchair.

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Fig. 2 — Arrangement, construction, and usage of Wheelchair Fender Drive. *Top left,* Fender drive attached to wheelchair. *Top right,* Components of Wheelchair Fender Drive: *A,* fender; *B,* spider arms; *C,* springs (elastic tubing); *D,* collar. *Bottom left,* Starting position before thrust for wheelchair propulsion. *Bottom right,* Finishing position at end of thrust; note relative position of spider arms and springs in bottom photographs.

second stroke of the wheelchair is now possible. The construction, arrangement, and usage of the Wheelchair Fender Drive are illustrated in figure 2.

The Wheelchair Fender Drive has not solved all the problems of wheelchair propulsion by any means, but it has solved most of the problems for those people who cannot return their arms to the starting position for propelling a wheelchair. It has increased the wheelchair speed of some who have a limited range of motion of shoulder extension or elbow flexion. It has allowed some patients who have limited range of motion of finger flexion to make the gross grasp between the fender and the rim, even though they cannot grasp the wheel rim alone.

Finally, the Wheelchair Fender Drive has had enthusiastic reception, not only by patients with defective hand grasps, but by many others with normal arms, for it enables them to propel their wheelchairs without getting their hands and cuffs dirty from the dirt picked up by the tires of the wheelchair.

Use of Sand as an Ambulation Medium in Gait Retraining and Correction of Faulty Foot Posture

Folke Becker, M.D.
and
Willis F. Denny, B.S.
Dublin, Ga.

● The use of a sand area as a treatment adjunct in gait retraining, correction of faulty foot posture and poor weight distribution, and in toning and strengthening the smaller muscles of the foot and ankle provides definite advanteges for both the patient and the instructor as compared to the use of hard surfaces in rendering such treatment.

This paper is based on observations and evaluation of the use of a sand area in providing treatment for certain ambulation problems. A sand-surfaced area theoretically seemed to have many advantages to offer in treatment involving gait retraining, re-education and restoration of the basic functions of the muscles of the foot and lower leg, and in providing for proper weight distribution over the plantar surfaces of the foot.

Treatment Area and Equipment

A specified amount of floor surface was devoted to this project which was to be located within the corrective therapy clinic. The space allocated was an area, formally used as a solarium, 15 ft. wide and 30 ft. in length. This was, and still is, considered the ideal amount of space needed for such a treatment area.

The proper type of sand required was a sand, possessing the necessary resiliency, that would not pack through continued ambulation upon the surface, and that would retain its sanitary qualities through daily turning and exposure to the sun (ultra-violet) within its structure. This necessitated a white, washed sand of semicoarseness, which we obtained within the immediate vicinity at reasonable cost ($2.00 per cubic yard).

A single hand rail 18 ft. in length was installed in the center of the area. This was to be a means of support by the patient in the beginning phase of treatment. The floor surface was then covered with a 6-inch thickness of sand (8 cubic yards).

A single, full-length, posture mirror was placed at one end of the area in alignment with the hand rail so that the patient might observe and help correct faulty ambulation and postural defects as pointed out by the therapist.

Method of Treatment

The treatment program was then instituted, and was executed under the supervision of the corrective therapist. The physiatrist referred for treatment patients who had had the following types of disability: (1) Recent cerebrovascular accidents (hemiplegia) with significant involvement of the lower extremity; (2) rheumatoid arthritis with specific involvement of the foot, ankle, and knee joints; and (3) lower extremity amputations. Exercise activities prescribed for hemiplegia consisted of standing, squatting, balancing, toe raising, re-education technics, ambulation with assistance of the hand rail, and free ambulation. For the arthritic patient with involvement of the foot and ankle, activities such as standing, squatting, toe raising, ambulation (assisted or unassisted) training directed toward obtaining weight distribution over the entire plantar surface, rather than wholly on the primary weight-bearing points which often appear to be sources of greatest pain, and toning and strengthening of the muscles of the toes, foot, and leg were prescribed. Exercises in the sand, designed to promote body balance, strength, agility and endurance, are prescribed for the contralateral limb of the lower extremity amputee. This is partly accomplished through induced disequi-

Read by title at the Thirty-fifth Annual Session of the American Congress of Physical Medicine and Rehabilitation, Los Angeles, September 8-13, 1957.
Chief, Physical Medicine and Rehabilitation Service, VA Hospital.
Chief, Corrective Therapy, VA Hospital.
This study was reviewed in the Veterans Administration and is published with the approval of the Chief Medical Director. The statements and conclusions published by the authors are the result of their own study and do not necessarily reflect the opinion or policy of the Veterans Administration.

Fig. 1 — Patient walking in sand ambulation area. General attitude of confidence. Legs, feet, and head in good postural relationship.

librium by the therapist and the prompt regaining of equilibrium by the patient. Concurrently, a separately prescribed program of resistive exercise is applied to condition and strengthen the stump for use of a prosthesis.

Where bracing or foot and leg support adaptations are not absolutely necessary, ambulation and prescribed exercise is performed barefooted. In those instances where it is necessary to improve postural alignment before ambulation can be attempted, special foot and leg wear in the form of orthopedic shoes, braces, and other support adaptations are employed temporarily with a view toward ultimate ambulation in the bare feet.

Advantages of Sand-Surfaced Area

Based on treatment results and close observation of the types of patients enumerated above, we feel that distinct advantages have been gained through utilization of a sand area. We find that the use of sand provides a tremendous psychological advantage over the use of a nonresilient or firm surface, in that the patient immediately loses his fear of falling. He knows that should he fall on his knees, buttocks, or other part of his body, he is not likely to sustain any injury. This inherent fear, in the majority of cases, prevents relaxation of the body musculature and thwarts the therapist in his efforts to institute a successful treatment program designed to teach proper body mechanics and promote ambulation. The patient cannot "slip," nor can he "trip," on a sand surface. This is well demonstrated by the patient through his apparent loss of fear when he enters such an area (fig. 1).

Another advantage to be realized by the use of sand is its quasi fluid property, or feel, which acts as a stimulus to motion of the foot and provides for support over the entire plantar surface. This distribution of weight serves to relieve much of the pain encountered during ambulation by those patients suffering from painful callus, bursitis, and synovitis peculiar to the joints of the foot and ankle. The patient soon learns that this even distribution of weight

enables him to ambulate with appreciably less pain than he encounters on other surfaces.

Sand also permits such flexing action of the toes as to afford greater shortening and, consequently, greater range of motion of their short and long flexors. This action serves to tone and shorten (tonic shortening) overrelaxed supports of the arch of the foot to a greater extent than does ambulation on a firm surface.

Another advantage demonstrated through use of sand is that the patient is able to make quick recovery movements which are not possible on a nonresilient surface. All of these factors combine to quickly restore the patient's self confidence and enables the therapist to promptly and efficiently institute his program of instruction directed toward ambulation retraining and toning and strengthening of the muscles of the foot and leg.

Summary

The use of a sand area as a treatment adjunct in gait retraining, correction of faulty foot posture and poor weight distribution, and in toning and strengthening the smaller muscles of the foot and ankle provides definite advantages for both the patient and the instructor as compared to the use of hard surfaces in rendering such treatment. A sand area permits the application of better and more efficient technics of treatment in the very early phase of the treatment program, thereby attributing to a significant decrease in the length of hospitalization. Such an area is economical to provide and can be fitted into any clinic in which space is available and a bit of ingenuity applied.

3rd International Congress of Physical Medicine

IIIe Congres international de Medecine Physique

3° Congreso internacional de Medicina Fisica

3. internationalen Kongress für Physikalische Medizin

Week of

August 21, 1960

WASHINGTON, D. C., U.S.A.

Preliminary information regarding this meeting may be had from the Office of the Secretary General: WALTER J. ZEITER, M.D., or from the Executive Secretary, DOROTHEA C. AUGUSTIN, 30 North Michigan Avenue, Chicago 2, Illinois.

YOU'VE said good-by to the bride who was once your little girl, and to that handsome boy who is now your son. The youngsters are on their own: and so, after twenty-odd years, are you! Now is the time to think of yourselves—your pleasures, your security, your eventual retirement. A good time to start putting part of your savings away in safe, sure, United States Savings Bonds. Where nothing can touch your principal. And where your money earns 3¼% when bonds are held to maturity. Series E Bonds grow in value, year by year—and Series H Bonds pay you interest twice a year. Whichever you choose, start your bond program today! When financial independence counts, count on U. S. Savings Bonds!

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medical news

Members are invited to send to this office items of news of general interest, for example, those relating to society activities, new hospitals, education, etc. Programs should be received at least six weeks before date of meeting.

Personals

Herbert Kent, Oklahoma City, presented the paper "Restoration for Self Care" at the Geriatric Nursing Institute Program at Norman, Okla. In addition, he participated in "A Demonstration and Staffing of Cerebral Palsied Patients" at a recent speech and hearing conference; Dr. Kent is also scheduled to deliver the paper "Rehabilitation Potential in Quadriplegic Teenagers" at the annual meeting of the American Medical Association. — **Howard A. Rusk,** New York City, was recently named president of the eighth world congress of the International Society for the Welfare of Cripples. This meeting is scheduled for the week of August 29, 1960, at the Waldorf-Astoria Hotel in New York City. — **Orlando M. Fontes,** Rio de Janeiro, has been appointed honorary consultant in the field of rehabilitation for the Conjunto Sanatorial de Curicica which is a 1500 bed hospital. — **Reuben Leass,** Far Rockaway, N. Y., discussed "Low Back Pain" at a meeting of the Queens Clinical Society in Jamaica, N. Y., and presented "The Medicolegal Aspects of Back and Neck Injuries" at a meeting of the American Board of Legal Medicine. — Among participants in the annual meeting of the Ohio State Medical Association were **Keith C. Keeler,** Akron; **Richard D. Burk,** and **Ralph Worden** of Columbus, and **Paul A. Nelson** and **Charles Long II,** of Cleveland. — At the annual meeting of the Michigan Academy of Physical Medicine and Rehabilitation, **James W. Rae, Jr.,** of Ann Arbor, was elected president; **Lewis Cohen** of Detroit was elected vice-president; **Leonard F. Bender** of Ann Arbor was elected secretary-treasurer. **Kathryn McMorrow,** Detroit; **George H. Koepke,** Ann Arbor, and **Russell Blanchard,** Detroit were selected to serve as trustees; as the immediate past-president, **Max Newman,** Detroit, is now a member of the board of governors.

Lenox Baker, Durham, N. C., was announced as winner of the 1957 Physician's award of the President's Committee on Employment of the Physically Handicapped. He was selected from among 37 physicians from throughout the nation who had been recommended by the Governors' committees. The award, an illuminated scroll bearing the signature of President Eisenhower, was presented to Dr. Baker by Major General Melvin J. Maas, chairman of the President's Committee. — **Louis B. Newman,** Chicago, delivered an illustrated lecture on "The Role of Physical Medicine and Rehabilitation in Spinal Cord Injuries" at the meeting of the American College of Surgeons in Salt Lake City on March 17. — **Christopher J. McLoughlin,** Atlanta, Ga., was elected Secretary-Treasurer of the Medical Association of Georgia for 1957-58. — **John W. Deyton** formerly of Milton, W. Va., has returned to St. Louis where he has resumed his teaching commitments and plans to engage in the private practice of physical medicine and rehabilitation. — Listed among the speakers for a three-day meeting of the National Geriatrics Society were **Jerome S. Tobis,** and **Howard A. Rusk** of New York City and **A.B.C. Knudson** of Washington, D. C. — **Arthur Steindler,** Iowa City, was reelected vice-president of the United States section of the International College of Surgeons. — **George G. Deaver,** New York City, is the medical supervisor of The Blind Children's Research Project for the emotionally disturbed and multiple handicapped.—**Gordon M. Martin,** Rochester, Minn., was among fifteen alumni of Nebraska Wesleyan University cited at an honor convocation. — The Ohio Academy of General Practice at its meeting in Columbus, Ohio, heard **Paul A. Nelson** of Cleveland present the paper "Rehabilitation of the Hemiplegic Patient."

Eugene L. Jewett, Orlando, Fla., attended the annual meeting of the Society of Orthopedic Surgery and Traumatology in South America. Dr. Jewett presented papers on "The Place of Replacement Prosthesis and Hip Joint Trauma" and "The Rigid Internal Fixation of Intracapsular Femoral Neck Fractures." — **Donald A. Covalt,** New York City, participated in a symposium on arthritis in conjunction with the annual meeting of the Florida Academy of General Practice. Dr. Covalt was also guest speaker at the Southeastern Surgical Congress in Baltimore. — Represented at the 1957 meeting of the Pennsylvania State Medical Society were **Herman L. Rudolph,** Reading, Pa.; **Murray B. Ferderber,** Pittsburgh; **Harold Lefkoe** and **William J. Erdman** of Philadelphia, and **Ruth N. Miller,** Sharon, Pa. — **Frank H. Krusen,** Rochester, Minn., has been cited by Minnesota's Governor Freeman for his service

as chairman of the Governor's advisory committee on Vocational Rehabilitation. — **William D. Paul,** Iowa City, presented the scientific exhibit "Diagnostic Aids — Rheumatoid Arthritis" at the annual meeting of the Iowa State Medical Society. — The Southern California Society of Physical Medicine announced the election of **David Rubin,** Los Angeles, to serve as secretary and **Roy Nyquist,** Long Beach, Calif., to serve as chairman for 1958. — At the 87th annual session of the California Medical Association, the following papers were presented: "The Scientific Basis for Neuromuscular Reeducation — Practical Applications" by **Harvey E. Billig, Jr.,** Los Angeles; "Seizure Problems in Cerebral Palsied Adults" by **Joseph E. Maschmeyer,** Los Angeles; "Results of a Long-Term Physical Treatment Program in a Severely Involved Quadriplegic Resulting from Anterior Poliomyelitis" by **Richard W. Moore,** Santa Monica; "The Management of Chronic Progressive Respiratory Insufficiency" by **Clarence W. Dail,** Los Angeles; "Rehabilitation of the Aged" by **John H. Aldes,** Los Angeles; "Analepes and Treatment of the Low Back Pain Syndrome" by **Rene Cailliet,** Los Angeles; "Physical Medicine in the Treatment of Arthritis" by **Edward P. Reese,** Lynwood,; "Peripheral Surgery in Adult Hemiplegia" by **Walter J. Treanor,** San Francisco; "The Frozen Shoulder" by **Leonard J. Yamshon,** Los Angeles; "Physical Treatment of Cervical Strain" by **O. Leonard Huddleston,** Santa Monica; "Physiological Basis and Clinical Application of Ultrasonic Therapy" by **David Rubin,** Los Angeles; "Uses and Limitations of Electromyography" by **Robert V. Miller, Jr.,** Beverly Hills, and "Getting the Hemiplegic on His Feet" by **Elizabeth Austin,** Los Angeles.

Correspondence

308 City Building
Asheville, N. C.
April 9, 1958
Dr. Fount Richardson, President-Elect
American Academy of General Practice
316 W. Dickson St.
Fayetteville, Ark.

Dear Doctor Richardson:

Mrs. Wilson and I congratulate you on your new honor as President-Elect of the American Academy of General Practice.

We know the Academy will be under splendid guidance and leadership. Southern Medicine should be especially proud of you in view of your pioneer efforts to have the Academy recognized sectionally and then nationally.

On behalf of the American Academy of Physical Medicine and Rehabilitation we will be happy to cooperate on any common problems with your Academy.

We extend to you our best wishes for your happiness and success in your new work.

Sincerely yours,
George D. Wilson, M.D., President
American Academy of Physical Medicine and Rehabilitation

National Neurological
Research Foundation
3255 N St., N.W.
Washington 7, D. C.
February 4, 1958

Dear Dr. Elkins:

The Scientific Committee, the General Advisory Committees, the Officers and Trustees of the National Neurological Research Foundation wish to thank you for including us in the *Archives of Physical Medicine and Rehabilitation* of September, 1957. We appreciate your giving us space in this esteemed magazine.

We are enclosing a brochure to let you know further what we are doing. We are also enclosing the announcement of our first Fellowship, which we hope is good news to the neurological field.

Thank you again for your kindness to us.

Sincerely yours,
Katherine Denckla
Executive Secretary

A Rehabilitation Program

Physical rehabilitation of injured workers is "part and parcel" of medical care under workmen's compensation, according to "A Rehabilitation Program," a booklet just published by the Association of Casualty and Surety Companies.

The booklet discusses medical rehabilitation, workmen's compensation, federal-state vocational rehabilitation and then, in step-by-step fashion, presents a major plan for the establishment, by any carrier of workmen's compensation insurance, of a well organized rehabilitation program as a part of regular medical services and a method for extending that plan to provide close liaison and referral arrangements with vocational rehabilitation services when needed.

The program, drafted by the Advisory Committee of the association's Claims Bureau, is based on the premise that "the carrier-sponsored physical rehabilitation program on the compensation case will prove the most effective in returning the injured workman to employment and self-sufficiency in the shortest possible time."

In announcing publication of the booklet, J. Dewey Dorsett, general manager of the association, called attention to the fact that physical rehabilitation is a matter of common concern to employers and employees, to state agencies, the medical profession and to the insurance industry.

Copies of the booklet, in reasonable quantities, are available to interested groups and individuals at no cost. Requests should be addressed to the Public Relations Department, Association of Casualty and Surety Companies, 60 John St., New York 38, N. Y.

A New Award For Medical Writing

The editors of *Modern Medical Monographs,* a quarterly publication, announce an award for the best unpublished manuscript for a short book on a clinical subject in the field of internal medicine. The purpose of this award, which will be known as the Modern Medical Monograph Award, is to stimulate young physicians to communicate their work in the classical form of the monograph and to achieve high standards of medical writing. The winner of this competition will receive $500. In addition, the winning monograph, if found suitable, will be published as a book in the series Modern Medical Monographs. The entries will be judged for style and clarity of expression by a committee of the American Medical Writers' Association and for clinical interest and scientific value by the Editors and Advisory Board of Modern Medical Monographs.

The following rules apply: 1. The author (or authors) must be a graduate physician, less than 40 years of age. Single authorship is preferred, but two co-authors will be acceptable. The name of the medical school from which the author graduated and his date of graduation should be stated; 2. Manuscripts should be submitted in duplicate (original and one copy) by registered mail, postmarked *no later than October 1, 1958,* to Richard H. Orr, M.D., 37 E. 67th St., New York 21, N. Y.; 3. The manuscript, including the bibliography, must consist of between 115 and 200 double-spaced typewritten pages with ample margins and not more than 40 illustrations (figures or photographs). For each illustration used, the allowable upper limit of typewritten manuscript pages should be reduced by one, and 4. Fishbein's book, "Medical Writing" (third edition), should be followed in preparation of the manuscript, use of abbreviations, and bibliographic form.

Blood Pressure Device Inserted Inside Body

An electronic blood pressure recorder small enough to be inserted in a blood vessel and pushed up into the heart has been developed. The meter is about the size of the end of a match stick and causes no pain or discomfort as it is moved through the body. It is fastened to the end of a thin flexible plastic wire and inserted into a vein in the arm.

Blood flows back through the veins because of several forces acting on it, one being the suction action created by the heart and lungs, and another being muscular contraction around the veins. The new device contains a small float or plunger that hangs freely in a magnetic field, with the tension of a tiny coil spring. As the pressure in the vein changes, the plunger moves and causes a small electrical impulse to travel along the wire to an amplifier and recording device outside the body. The device was developed by Dr. Otto H. Gauer, a German physiologist who spent several years in the United States.

New Publication Orients Doctors On Changing National Health Patterns

Timely statistical 'profiles' on major health problems, ranging from allergic ailments to cardiovascular disease, form the theme of a new monthly publication, "Patterns of Disease." Prepared by Parke, Davis & Company, the publication is being offered as a service to the medical profession.

Major aims of "Patterns," according to company spokesmen, are to provide information which physicians can use to anticipate health problems in their areas; to determine which diseases they will encounter most often among various age groups and in various localities; and to choose fields of specialty most useful to their own communities. For instance, midwestern physicians, reading in the first issue of "Patterns" of the high concentration of older people in their area, may decide to place more emphasis on geriatrics.

Future issues of the publication will deal with such topics as cardiovascular disease, arthritis, allergic diseases, diabetes, and mental health.

The first issue, now being mailed to 140,000 physicians throughout the country, is devoted to the growing problem of America's aged population. It deals with such questions as: "Where do our older people live?" "What does our longer life span mean?" "What type of care will the aged require?" "How much will it cost?" Maximum concentrations of older people are in such far-flung areas as the New England states, the Great Plains states, and in Florida, rather than the Gulf states and on the West Coast, as is widely believed.

The publication also stresses the growing number of aged people in our population, especially women. Since 1900, it states, the population of the United States has almost doubled but the number of persons aged 65 and older has more than quadrupled. In 1975 it is estimated that 10 in every 100 Americans will be in the older age group, and six of these will be women. Our life span has increased from less than 50 years in 1900 to slightly over 70 now. This rapid increase in life expectancy, however, is coupled with a rise in the death rates for the chronic diseases, with heart disease exacting a heavier toll than all other diseases combined, according to the publication. Heart disease, too, ranks as the

commonest chronic disease, afflicting well over half of the older age group. Other major health problems in this group include arthritis and obesity.

Knock-Knees in Children Are Usually Outgrown

Knock-knees are very common among toddling infants but are usually outgrown and should not cause parents unnecessary concern, Dr. A. J. M. Morley of the Institute of Orthopaedics, London, reports. Fortunately, knock-knees usually improve without treatment. Except for surgery, there is no effective treatment known for the condition. More than 1,000 examinations of normal children were made and revealed knock-knees in 22 per cent of those between the ages of three and three and one-half years. At the seven-year level, however, only one to two per cent of them still had the same amount of "knock."

Knock-knees in children under seven can probably be safely ignored unless the abnormality is excessive or there is some underlying cause for it, such as rickets or a broken bone. An underlying cause should be suspected if the knock-knee is of unequal amount in the two legs, the child is short for his age, or if there is a family history of severe knock-knee or other bone deformity, Dr. Morley advises.

Hormone Shots Give Rats Hardened Arteries

Injections of the hormone ACTH have been found to produce extreme hardening of the arteries in rats, a species that is naturally immune to the disease.

This finding will help speed research on the cause of heart disease in man, Drs. Bernard C. Wexler and Benjamin F. Miller, May Institute for Medical Research, Cincinnati, reported to the American Heart Association meeting.

Special feeding has not been successful in producing artery-hardening in rats although injections of large fat-bearing molecules taken from human blood plasma have been reported to be effective in clogging rat arteries with deposits similar to those seen in humans. Doses of ACTH, an adrenal-stimulating hormone produced by the pituitary gland, were given to the rats and produced damage resembling that found in extreme senility in human beings. The arteries were dilated, with bulges or sagging pockets in the walls resulting from loss of elasticity.

Another finding was that the ACTH did not cause the rats' blood to become enriched with fat; they were not being fed a diet containing excessive amounts of fat. This is noteworthy because of the concern in recent years on the possible role of fats in causing hardening of the arteries, the scientists reported. Rats are convenient laboratory animals to work with because they are easier to house and maintain and can be used in greater numbers than larger animals. Nutritionally speaking, the rat is more closely related to man than the often-used vegetarian rabbit.

Research In Aging

Research in aging will be conducted by Veterans Administration under a new division of the Department of Medicine and Surgery in Washington, D. C. The division will survey possibilities for research in retarding physical or mental deterioration, through study of the aging process as such, as well as coordinate the approximately 2,000 studies of disorders associated with aging that are under way in VA hospitals.

Dr. Charles C. Chapple, former chief of VA's clinical studies division, will head the new division. He said the unit will enable VA to focus skills of specialists on problems of aging.

He said chemical, nutritional, psychological, biophysical, social, and clinical aspects will be considered as a whole, as these affect the individual.

Dr. Chapple said the division's program will be developed under guidance of five university consultants, each of whom is outstanding in a separate scientific field.

Feeble-Mindedness From Cretinism Prevented

Feeble-mindedness resulting from congenital hypothyroidism, also known as cretinism, now can be prevented by a method of diagnosis and treatment developed by medical scientists at the University of Michigan. Prompt action at birth can save a child suffering with the disease from a life of mental and physical retardation that often spells life-long institutional care. This was found in a study of 83 cretins made by William H. Beierwaltes and George Lowrey. The team members claim they "have discovered concrete data, for the first time, that early diagnosis and treatment with larger than generally used doses of thyroid medication will result in the child attaining a normal IQ and good physical development."

The disease afflicts children at birth. It is a form of endocrine gland disease resulting from being born with no thyroid gland, a gland that produces a limited amount of thyroid hormone, or a very active gland that produces no hormone. The thyroid hormone is "vitally" important to the development of insulation around nerve strands and, without it, something very much like a "short circuit" takes place, causing mental and physical retardation.

In spotting the disease at birth, Drs. Beierwaltes and Lowrey say there are nine medical and physical criteria that act as

warning signals and warrant one or more of five laboratory tests. These criteria are: high birth weight (more than eight pounds); umbilical hernia; feeding or respiratory difficulty at birth; constipation; retarded growth; dry skin; lethargy, and unusual sleepiness in the period shortly following birth. The doctors stress, however, that the presence of one or more of these conditions does not mean a baby has congenital hypothyroidism. If the laboratory tests show the child is suffering from cretinism, "prompt application of thyroid hormone substitutes can prevent the 'short circuit,' permitting the child to have a normal life."

Machine Reads Articles, Writes Their Abstracts

This item can be read and a shortened version of it written by an electronic machine. Just such an electronic abstracter has been developed by engineers of the International Business Machines Corporation. The system is called "Auto-Abstract." It can read articles or scientific papers and then write an abstract or shortened version of what the text was all about. It promises to prove helpful in the current national problem of scanning and excerpting scientific articles, both in English and foreign languages.

"Auto-Abstract" works this way: The complete text of an article is transcribed onto magnetic or punched tape in a code that can be understood by an electronic "brain." The computer then analyzes the text word by word to "derive statistical information concerning the frequency and distribution of the words in the text." From this, the electronic abstracter determines the relative degree of significance of the words and grades each sentence as to its importance. Those sentences scoring highest are extracted and printed out by the machine.

New Service to Medical Communications Developed

An extraordinary new service has been developed for both medical communications and medical education. It is described by leading physicians as an "historic" development, expected to encourage greatly the communication of new medical knowledge and clinical research results via the medium of medical exhibits. For the first time, the most outstanding scientific exhibits at major annual medical conventions are being preserved. This is being done on film strip, using the latest audio-visual technics. Every medical college, teaching hospital and county medical society is being offered the opportunity to start building its own "library" of film-strips.

In preliminary showings to physicians, the "Exhibits-On-Film" have been called "better than being there." Thus individual physicians as well as faculty members and students who do not have a chance to see some of these outstanding exhibits will be able to study them in detail through the filmstrips. Those engaged in medical research or clinical investigations may get ideas in this way for their own exhibits at other conventions and may examine the latest audio-visual technics available in medical communications.

The project is called "Exhibits-On-Film, a Library of Scientific Exhibits." It is supported by Lakeside Laboratories, Inc., which has established the Master Library and made a similar library available on request to all county medical societies, teaching hospitals and medical colleges. A staff of medical journalists and photographers have started to attend major medical meetings, including the two annual sessions of the American Medical Association and those of other national, regional and specialty organizations. With the cooperation of the organizations and the physicians whose exhibits are selected, the filming includes important close-ups of illustrative visual and audio material. Compact and easy to use, each addition to the library consists of small cans of filmstrips, a long-play record, and printed instructions. The material is easily filed in medical college or society libraries.

Individual physicians who wish to see the first filmstrips are asked to contact the executive secretaries of their county medical societies. Hospital personnel are asked to contact their superiors, who may check either with the nearest medical college library or county medical society. Complete libraries will be made available on a continuous and permanent basis to any medical college and county, state or regional medical society which requests this service, from Helen Martin, Executive Secretary, "Exhibits-On-Film," Lakeside Laboratories, Inc., 1707 E. North, Milwaukee 1, Wis. This "permanent contribution" to medical communications is free.

Male Is Weaker Sex

The male is the more perishable sex, even among houseflies!

Morris Rockstein and Harry M. Lieberman, of the Department of Physiology, New York University College of Medicine, studied more than 8,500 common houseflies (Musca domestica) and found that while 50 per cent of the females were alive at 30 days of age, only 5 per cent of the males were still alive. Half of the males died when about 16 days old.

The investigators said that females live as long as 63 days. The maximum longevity of the males is 54 days. The findings appeared in the British scientific journal *Nature*.

Training for Brace and Limb Makers to Be Offered Jointly by Rehabilitation Center, University Hospital

Two nine-month training courses, for ortho-

pedic and prosthetic technicians, will be offered jointly this year by the Institute for the Crippled and Disabled, the Presbyterian Hospital in the City of New York and Columbia University.

The courses will begin on September 8, 1958 and end on June 27, 1958. Candidates are being accepted from all parts of the world in an effort to meet the international shortage of qualified brace and limb-making technicians.

Persons accepted for the courses will spend the majority of their time in training at the Institute for the Crippled and Disabled, a comprehensive rehabilitation center. Academic instruction as well as practical experience in the making of braces and artificial limbs, and in working with patients requiring these devices, will take place at the Institute's Prosthetic and Orthopedic Laboratories. The balance of the trainees' time will be spent in clinical field training at leading hospitals and other institutions which provide services to patients involving the use of prosthetic and orthopedic equipment.

Prosthetic and orthopedic technician trainees will receive a basic curriculum which includes instruction in anatomy, applied physiology and rehabilitation technics. They will also be given practical experience in the construction, organization and operation of shops and facilities for the production of prosthetic and orthopedic devices.

The courses will be conducted under the supervision of Charles R. Goldstine, C.P.O., Director of the Institute's Prosthetic and Orthopedic Laboratories. The faculty will include certified prosthetists and orthotists of the laboratories, as well as professional staff members of the Institute's medical, vocational and social adjustment services, faculty members of the College of Physicians and Surgeons at Columbia University and personnel of Presbyterian Hospital.

The specialized training for orthopedic technicians will include a comprehensive study of materials used in the making of orthopedic devices, measuring and fitting procedures, the application of plaster technics to brace work and the actual construction and finishing of a wide range of orthopedic devices.

The specialized training for prosthetic technicians will include a study of the metals, plastics, fabrics and wood used in the construction of prostheses. Gait training technics, methods for using plaster in the making of prosthetic devices and measuring and fitting procedures are among the subjects which enrollees in this course will study.

The tuition for the nine-month course is $550.00. The Institute will provide all tools and major supplies. The cost of textbooks and certain other printed materials are to be defrayed by the enrollee.

Persons from within the United States desiring to enroll in the courses must have a high school diploma or equivalent. Applicants from foreign countries must have a working knowledge of the English language as spoken and written. Prior training in manual arts, mechanical drawing, anatomy and physiology is desirable but not necessary.

A descriptive brochure and application form may be obtained upon request to Mr. Goldstine at the Institute for the Crippled and Disabled, 23rd Street at First Avenue, New York 10, N. Y. Persons submitting their applications prior to August 1, 1958 will be given preference for enrollment.

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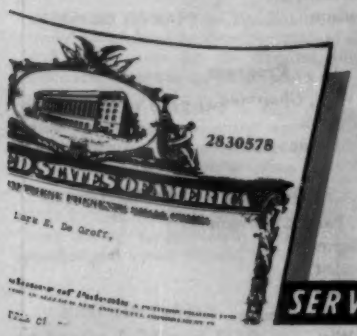

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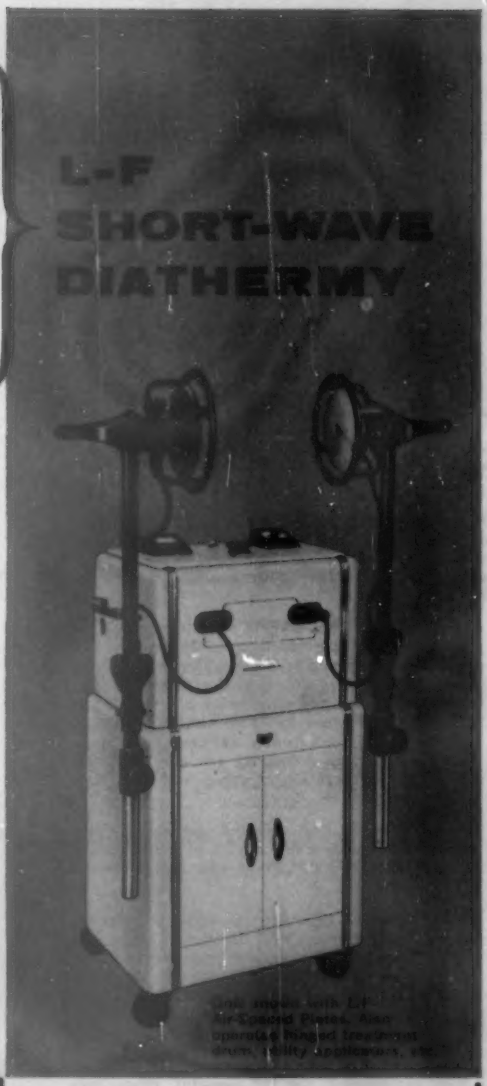

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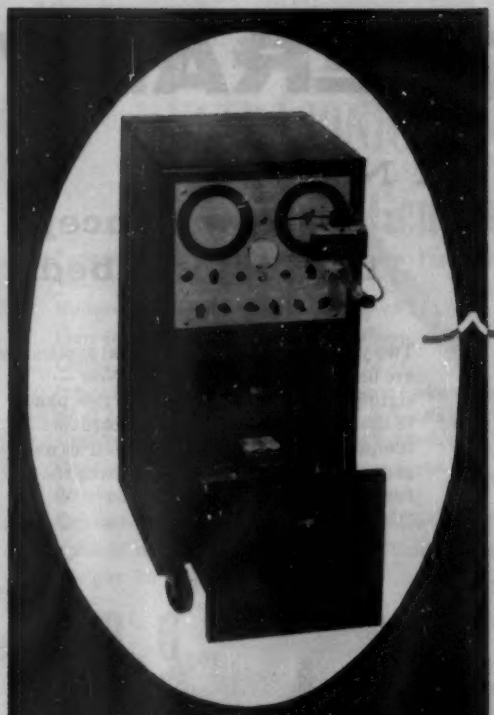

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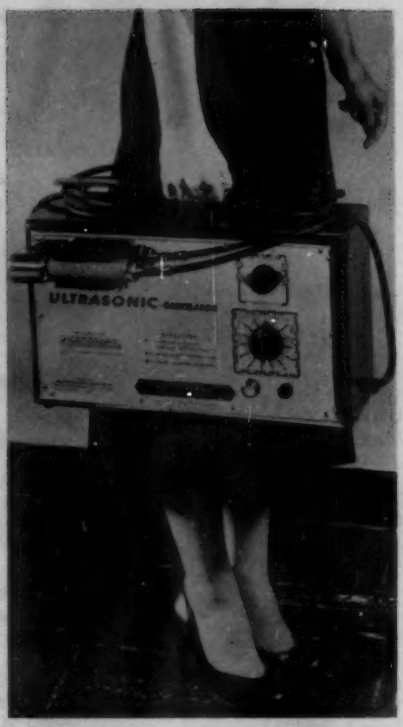

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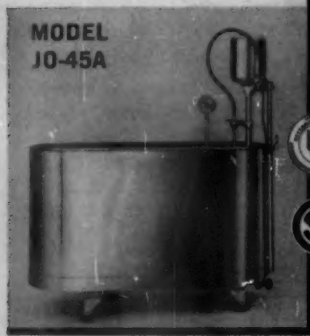

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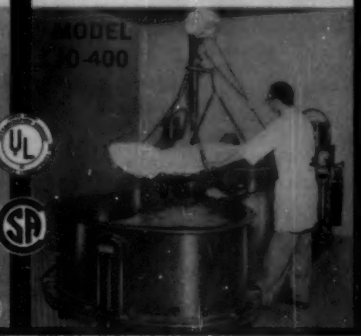

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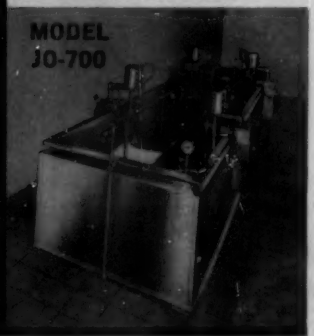

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To stimulate interest in the field of physical medicine and rehabilitation, the American Congress of Physical Medicine and Rehabilitation will award annually, a prize for an essay on any subject relating to physical medicine and rehabilitation. The contest, while open to anyone, is primarily directed to interns, residents, graduate students in the pre-clinical sciences and graduate students in physical medicine and rehabilitation. The Essay Award Committee suggests that members of the American Congress and American Academy of Physical Medicine and Rehabilitation bring this announcement to the attention of interested persons. The following rules and regulations apply to the contest:

1. Any subject of interest or pertaining to the field of physical medicine and rehabilitation may be submitted.

2. Manuscripts must be in the office of the American Congress of Physical Medicine and Rehabilitation, 30 N. Michigan Ave., Chicago 2, not later than June 2, 1958.

3. Contributions will be accepted from interns, residents, graduate students in the pre-clinical sciences, and graduate students in physical medicine and rehabilitation.

4. The essay must not have been published previously.

5. The American Congress of Physical Medicine and Rehabilitation shall have the exclusive right to publish the winning essay in its official journal, the ARCHIVES OF PHYSICAL MEDICINE AND REHABILITATION.

6. Manuscripts must not exceed 3000 words (exclusive of headings, references, legends for cuts, tables, etc.), and the number of words should be stated on the title page. An original and one carbon copy of the manuscript must be submitted.

7. The winner shall receive a cash award of $200.

8. The winner shall be determined by the Essay Award Committee composed of four members of the American Congress of Physical Medicine and Rehabilitation.

9. All manuscripts will be returned as soon as possible after the name of the winner is announced.

10. The American Congress of Physical Medicine and Rehabilitation reserves the right to make no award if, in the judgment of the Essay Award Committee, no contribution is acceptable. Announcement of the winner will be made at the annual meeting.

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2. Manuscripts **must be** in the office of the American Congress of Physical Medicine and Rehabilitation, 30 N. Michigan Ave., Chicago 2, not later than June 2, 1958.

3. *Contributions will be accepted from medical students only.*

4. The American Congress of Physical Medicine and Rehabilitation shall have the exclusive right to publish the winning essay in its official journal, the *Archives of Physical Medicine and Rehabilitation.*

5. Manuscripts must not exceed 3000 words (exclusive of headings, references, legends for cuts, tables, etc.), and the number of words should be stated on the title page. An original and one carbon copy of the manuscript must be submitted.

6. The essay must not have been published previously.

7. The winner shall receive a cash award of $100.

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9. All manuscripts will be returned as soon as possible after the name of the winner is announced. The winning manuscript becomes the exclusive property of the American Congress of Physical Medicine and Rehabilitation.

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